FOUNDRY

EST. 1902 TRADE JOURNAL

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

VOL. 108
No. 2250
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JANUARY 21, 1960
Offices: John Adam House, John Adam St., London, W.C.2

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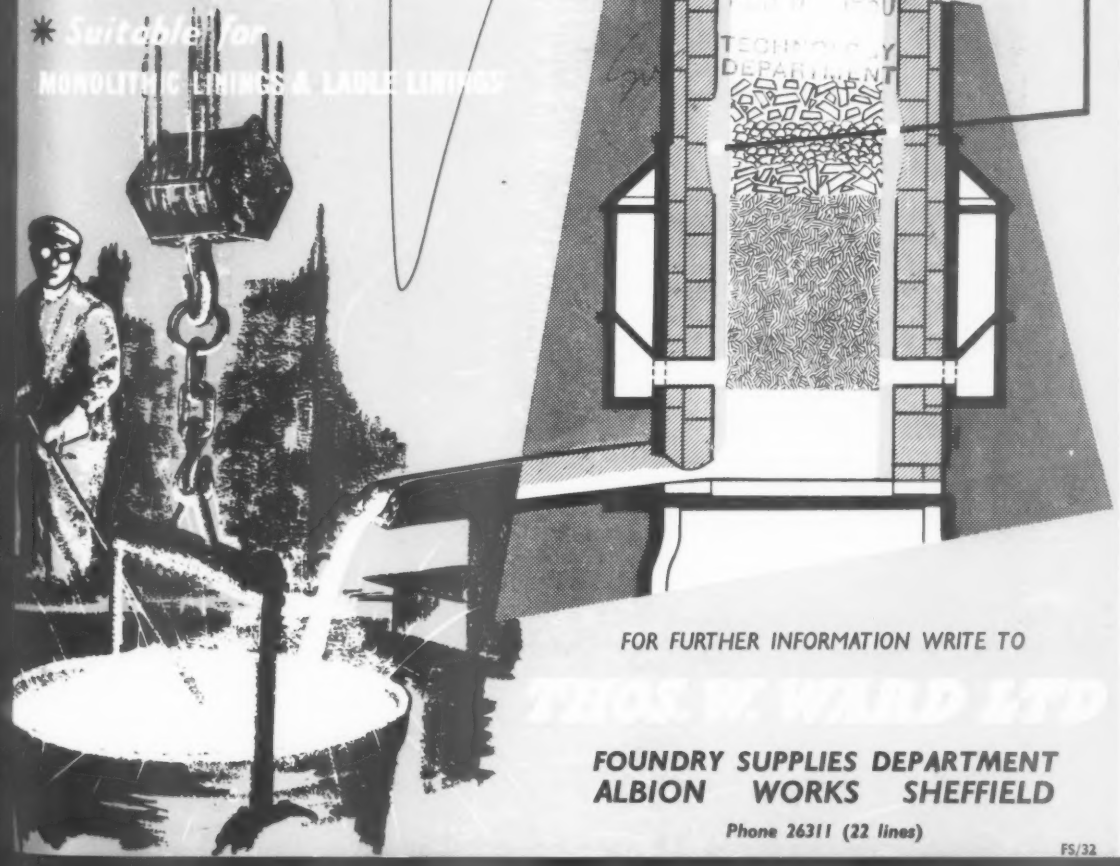

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TECHNOLOGY DEPARTMENT

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These machines embody either the B.S.C.R.A. or the B.C.I.R.A. Patent Systems of Dust Control and comply with the new Government Regulation 1 of the Grinding of Metals (Misc. Indus.) Regulations, and Regulation 7, para. (6) of the Iron and Steel Foundries Regulations, 1953.

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★ Totally enclosed motors avoid electrical breakdown.

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and **MODIFA** PREPARED METALLIC SODIUM

MODEGAS units degas and modify simultaneously providing positive technical and practical advantages which the busy foundryman cannot ignore.

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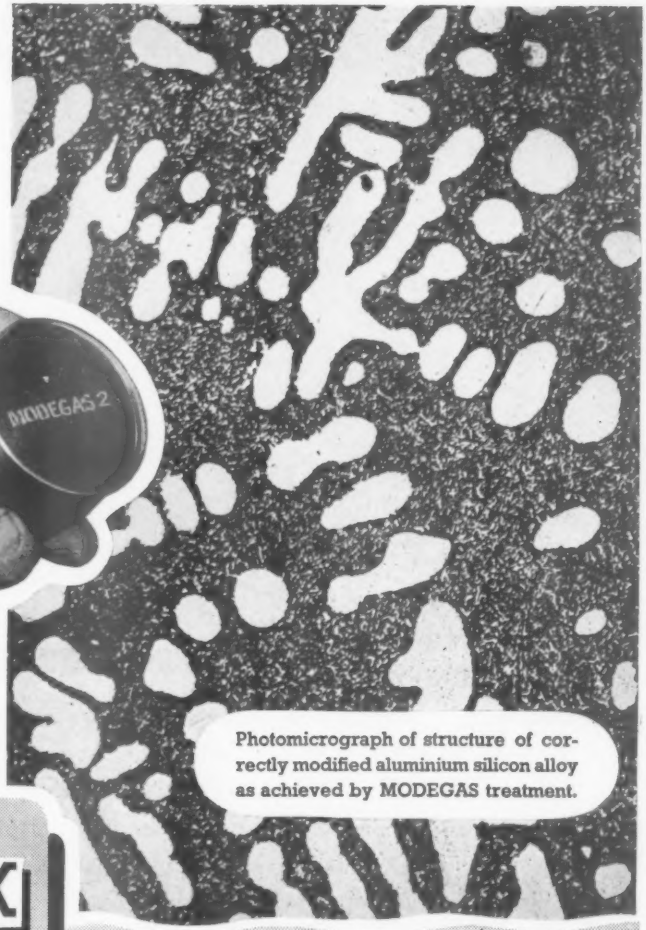

Photomicrograph of structure of correctly modified aluminium silicon alloy as achieved by MODEGAS treatment.

MODIFA is offered for the use of diecasters and other foundrymen who may require modified but not degassed metal.

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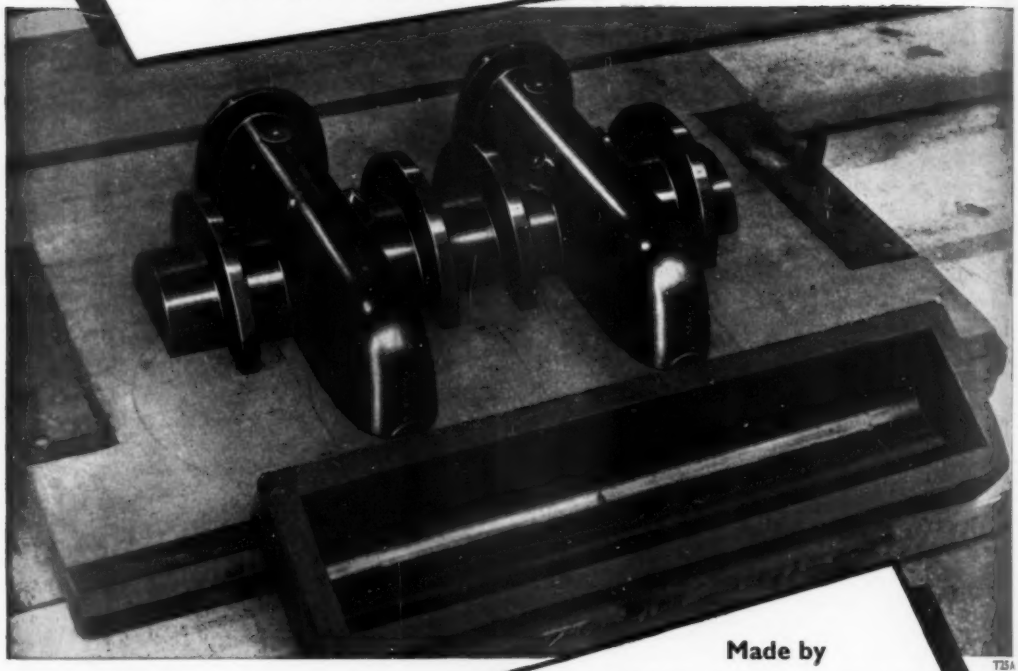
MARKET HARBOROUGH-LEICESTERSHIRE PHONE 2254 · 5 · 6 GRAMS HARMARK - M'HARBORO

Made in "EPOPHEN"



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More and more, "EPOPHEN" Epoxide resin is being used for making patterns and core boxes. "EPOPHEN" is simple and convenient to use however intricate and difficult the pattern; it is also safe to handle (negligible risk of skin irritation), and it ensures better sand moulds with easier stripping. Full details will be gladly sent on request.

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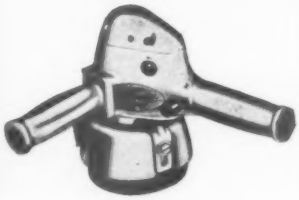


SURFACE GRINDERS

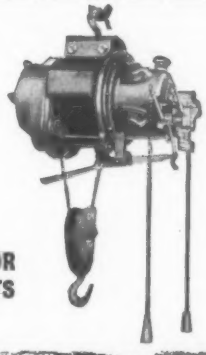
CHIPPING HAMMERS

GRINDERS

COMPRESSORS

SAND RAMMERS

MOTOR HOISTS



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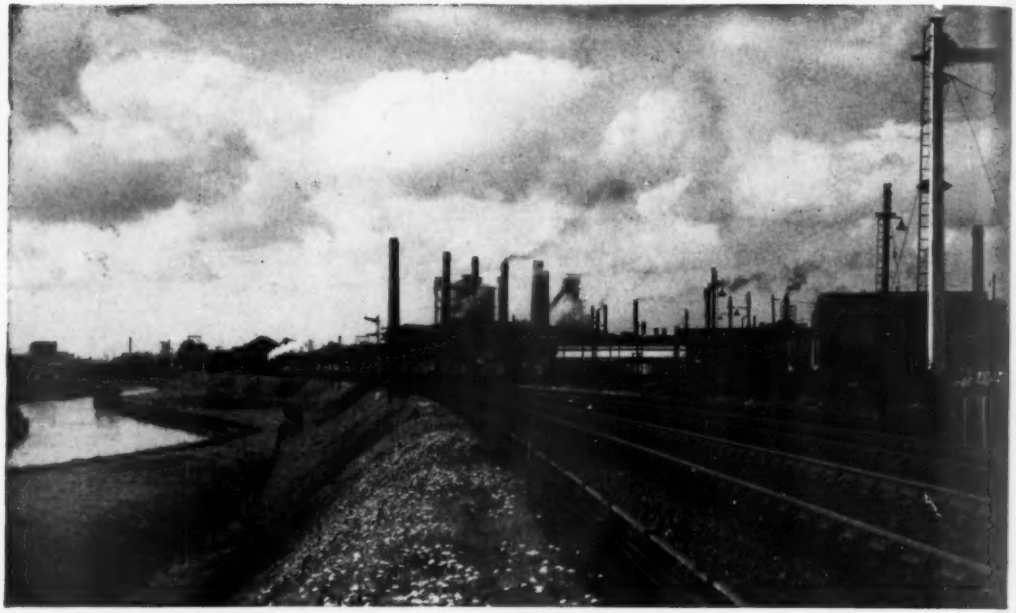

Staffordshire Landscapes

Over 100 years ago, sturdy horses tramped the banks of these canals, moving a steady flow of materials and products to and from Black Country Iron Works and Foundries.

As the new railway spread its net-work the passage of goods moved gradually from water to rail. Today, the busy lines, often following the easy contours of the old waterways, drive into the hearts of the factories.

The weed strewn highways of last century remain witnesses to the relentless advance of new ideas.

Progress in Staffordshire, bringing almost every major improvement in the technique of iron-founding since 1700, is apparent in the landscape of the County as well as in its products.

For almost a century and a half Pig Iron has been manufactured at Darlaston Iron Works. Today, the most modern methods of metallurgical control of raw materials and the finished product, enables them to supply Pig Iron of consistent uniformity to the most exacting specification.

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FOR QUALITY CONTROLLED REFINED PIG IRON

DARLASTON · STAFFORDSHIRE

A member of the Staveley Coal & Iron Co., Ltd., Group.

The **BLO SHOOTER** will blow or shoot cores and moulds using any sand which can be rammed by hand.

Built in England by

PNEULEC LIMITED, SMETHWICK, Nr. BIRMINGHAM

Roper

WET TYPE SPARK ARRESTERS

Designed by experts—the example shows the simple but scientific approach to a vital problem.

Photographs by courtesy of
BILSTON FOUNDRIES LTD.

Above:

View showing Wet type Spark Arrester with Inspection Platform serving 17-ton per hour Cupolas.

Left:

This highly efficient Spark and Dust Suppressor is provided with a Spray Jet giving double water curtain as illustrated.

E. A. ROPER & CO. LTD

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J.J.M.

mixed up good and proper

For mixing mixtures with meticulous requirements there is nothing to compare with the Fordath Mixer (8 models with batch capacities from 1 ton to 2 pounds). Designed and patented by Fordath, this machine was produced originally to mix various sands and bonding compounds for core-making in the foundry. Now it has been discovered by industry at large and is in daily use —here, there and everywhere—mixing powders of all kinds, with or without liquid bonding material; e.g. for glue, fibrous materials, asbestos insulating materials, abrasives, fluxes for welding electrodes, etc. etc.

So that you, too, may produce thoroughly blended mixtures,
ASK YOUR PEOPLE TO ENQUIRE ABOUT THE

FORDATH mixer

THE FORDATH ENGINEERING CO., LTD., BRANDON WAY, WEST BROMWICH, STAFFS
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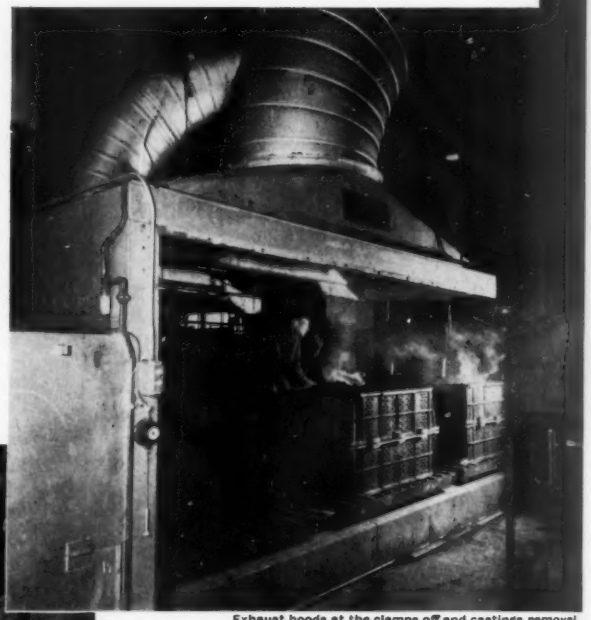
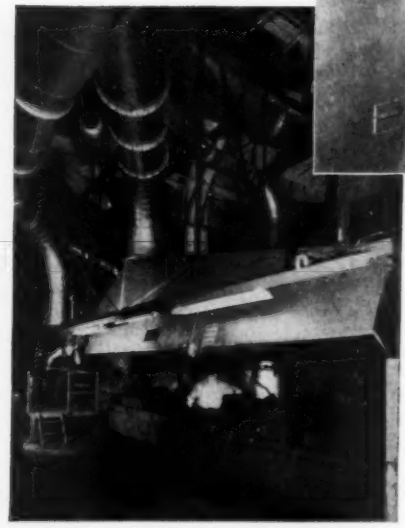
HOLMES—SCHNEIBLE

system for dust collection and control



Exhaust hoods at the clamps off and castings removal stations. Photographs reproduced by permission of the Ford Motor Co. Ltd.



The Holmes-Schneible System installed at the new Thames Foundry of the Ford Motor Co. Ltd., removes more than half a million cubic feet of dust and fume laden air per minute, thus ensuring optimum working conditions twenty-four hours per day In addition over 200,000 cubic feet of clean air per minute are supplied at certain points as 'compensating air' to maintain the foundry heating balance

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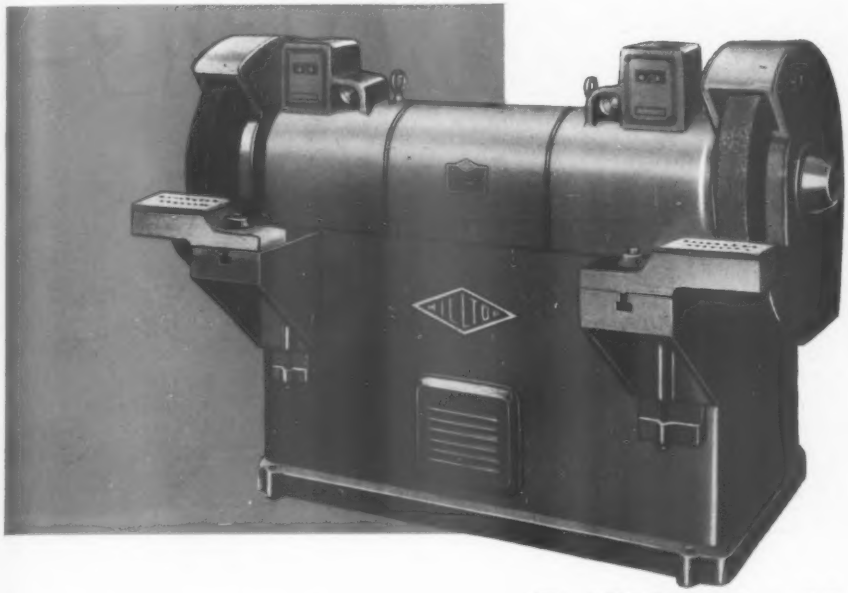
For full details please write for a copy of Publication No. 54/23

C24564

TWO GRINDERS – IN ONE!



In this new HILLTOP Grinder, each wheel can be driven independently of the other—at speeds to suit individual operators. This gives *twice* the capacity —at no extra cost.

The HILLTOP safety grinders comply fully with the Dust and Fumes regulations now in force. Available to specifications of British Steel Castings Research Association; and of the British Cast Iron Research Association.

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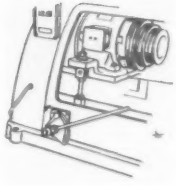
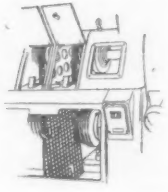
Shrouds and other special features ensure complete extraction.



SPEED CONTROL

Three speed changes on each wheel—independent of speed of other wheel.



INDEPENDENT DRIVE

Each wheel driven by own motor — independent of the other.

Write for full specification and prices to :
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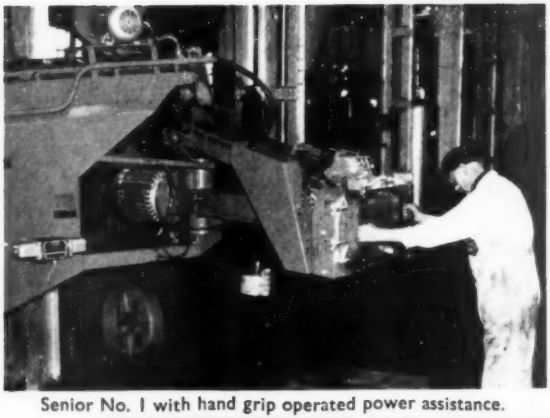
MOLINEUX

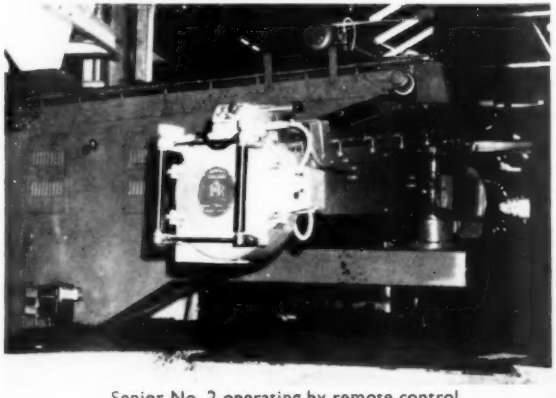
POWER ASSISTED SANDRAMMERS—

Senior No. 4 Mobile in action.

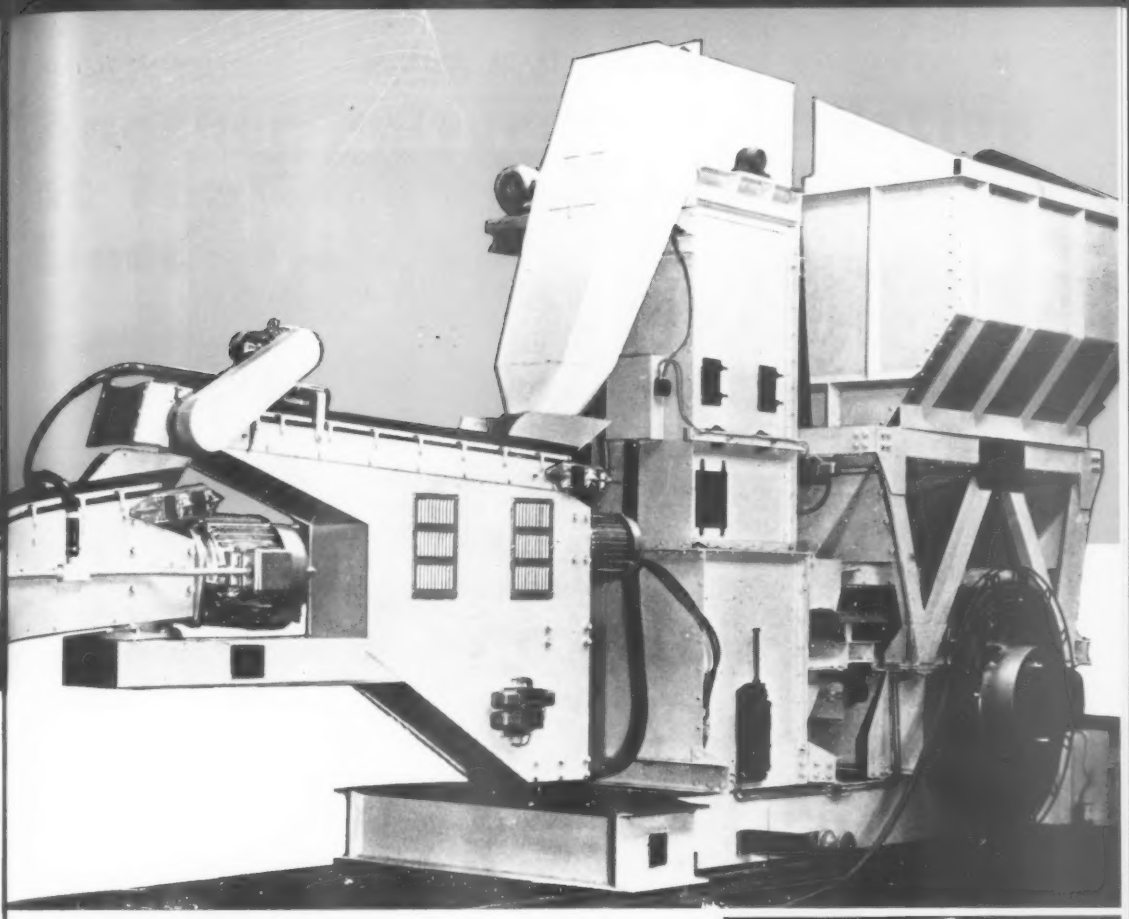


Senior No. 1 with hand grip operated power assistance.

Power assisted Junior Sandrammer in Core Shop.

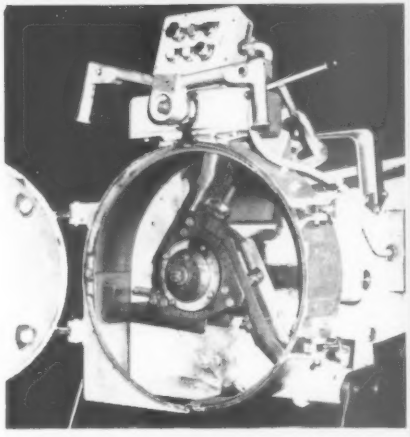


Senior No. 2 operating by remote control.



Mobile No. 4 Sandrammer, 15ft. radius, shown above has Patented 24in. dia. "Turbo-Ram" head illustrated on right. Feed Unit includes 7½-ton drop-bottom hopper and spare hopper. Fully automatic control from head. Output up to 2,000 lbs./min. "Turbo-Ram" head is also available on Stationary No. 4 and No. 3 Sandrammer with 10ft. radius.

F. E. Sandrammers are covered by British Patent Nos. 570641, 663318, 657197, 714063, 714064, 714065 and 742749. Patents granted or pending in other industrial countries throughout the world.



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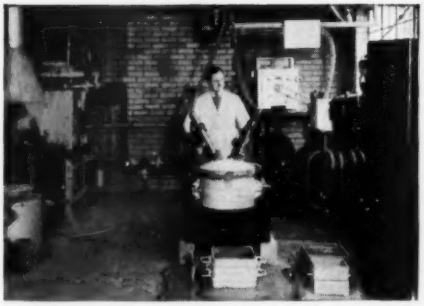
If you have a SAND CASTING PROBLEM 'FULBOND' may well be the solution!



We invite you at any time to call on the services of our experimental foundry and sand-testing laboratory. Our foundry technicians will be pleased to co-operate in helping you find the solution to sand casting problems. Or if you prefer, they can come to your foundry to discuss a particular difficulty on the spot. These Fulbond services are offered without charge. All details are, of course, treated in strict confidence.

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THE FULLERS' EARTH UNION LTD.

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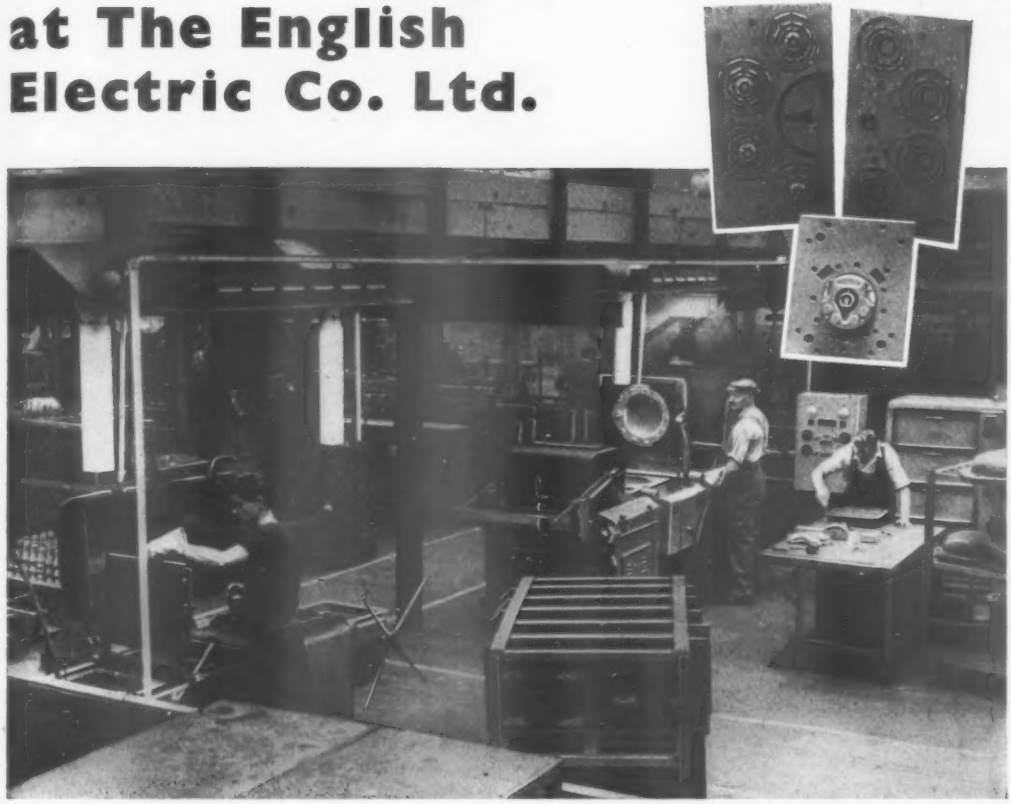
Another Polygram Installation at The English Electric Co. Ltd.



Photograph of a section of the Polygram Shell moulding equipment installed at the English Electric Company Limited, Bradford, Yorks.

Illustrations show a range of Shell Moulded Grey Iron Castings, previously produced by conventional sand moulding methods, on which substantial improvements and cost reductions have been made.

Any information you may require concerning the world famous range of precision built POLYGRAM Shell Moulding Machines and Equipment as supplied to principal foundries in Britain and the Commonwealth, The Ministry of Supply and the Crown Agents for oversea Governments and Administrations will be forwarded on request.

Photographs by courtesy of the English Electric Co., Ltd.

Polygram

THE FIRST NAME IN SHELL MOULDING

Polygram Casting Company Limited, Shernfold Park, Frant, Tunbridge Wells, Kent. Telephone: Frant 346 (5 lines).

NEWSTAD Continuous Core Drying Stoves

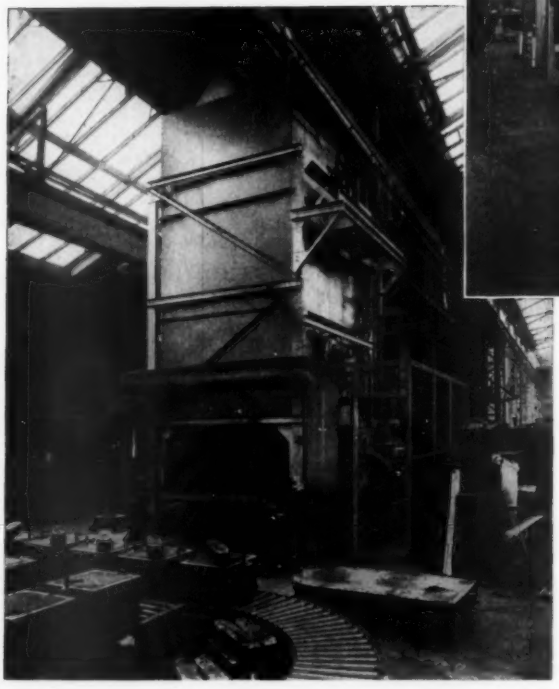


Photo by courtesy H. J. Hall Ltd., Dartford, Kent.

Newstad Continuous Core Stoves with our well known recirculation system gives reduced drying times, low fuel consumption, better drying and closer temperature control.

Vertical stoves with single or multi-loop conveyors, can be supplied with cooling chamber, and automatic loading and unloading equipment.

Horizontal stoves can be loaded at the coremakers bench, and unloaded where the dried cores are required, eliminating the need for handling hot coreplates.

Oil, Gas or Coke Fired.

MODERN FURNACES and STOVES LIMITED

Builders of INDUSTRIAL FURNACES

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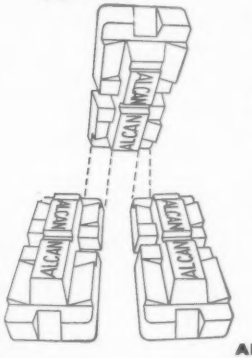
ALCAN 'TRI-LOK' ingots readily separate by lifting, though when stacked they interlock three ways and provide a bundle ready for fast handling by fork lift truck.



ALCAN (U.K.) LIMITED (specialists in aluminium ingot) have introduced a new and brilliant development in ingot design, the 'TRI-LOK'. This ingenious inter-locking shape enables ALCAN ingots to be stacked more compactly with greater safety and more speed because they 'mate' one to another – and resist lateral and lengthwise displacement. The consequent ease of handling has already given measurable cost savings in loading and storage operations to many ALCAN customers.

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TRI-LOK

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ALCAN
ALUMINIUM LIMITED OF CANADA

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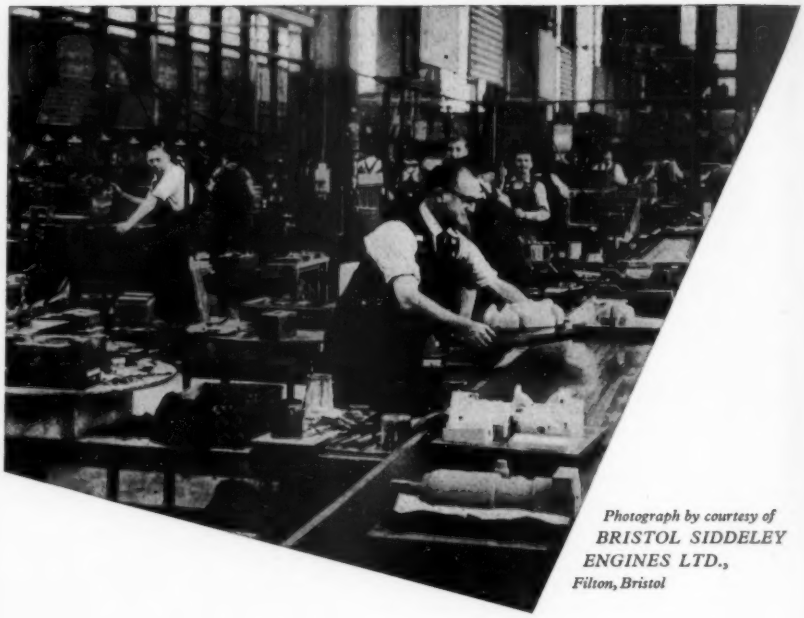
BIS *can help with your Sand problems*



Photograph by courtesy of BRISTOL SIDDELEY ENGINES LTD., Filton, Bristol

These leaflets may interest you— they will be sent free on request

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It grinds ★ sands ★ polishes ★

The Flexobelt attachment, designed for use on Flextol GF350 3-speed machine, is a most useful and versatile attachment for use in your shops. It will grind castings, remove surplus metal from welds, repairs, etc., and will carry out much of the work for which a whole range of grinding wheels, disc sanders, roller sanders and polishers are normally used. It works equally well on concave or convex surfaces, or even on jobs of irregular shape, and its use prevents burning of the metal, and it is particularly good for working on stainless steel. Interchangeable belts are used to cover all operations from grinding to final polishing. May we send you full particulars?

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AP 22

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This is admirably demonstrated by the extremely high standards of control in the production of non-ferrous metal ingots produced by the Sheffield Smelting Co. Ltd.

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The SHEFFIELD SMELTING Company Limited

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The "BROOMWADE" air compressors used by H & F Precise Castings Ltd. supply the air required to operate their wax injection machines. These machines produce the accurate wax patterns that are the first stage in the 'lost-wax' investment casting process for making high quality precision castings—castings that fulfil the exacting requirements of turbo-jet engines and also find many applications in the wider field of general industrial engineering especially where components of complex shapes are needed.

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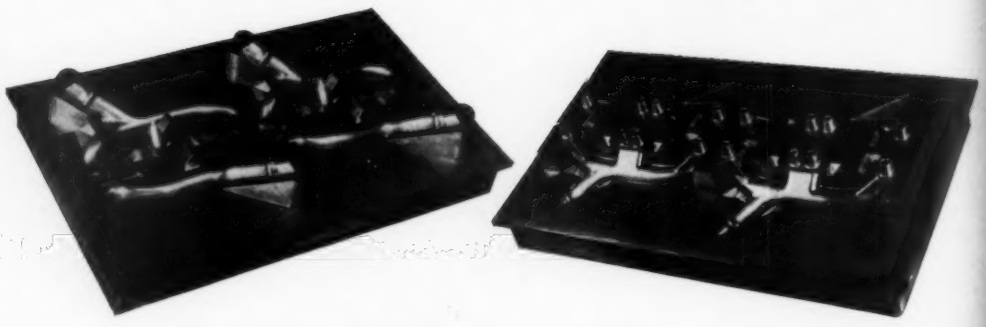

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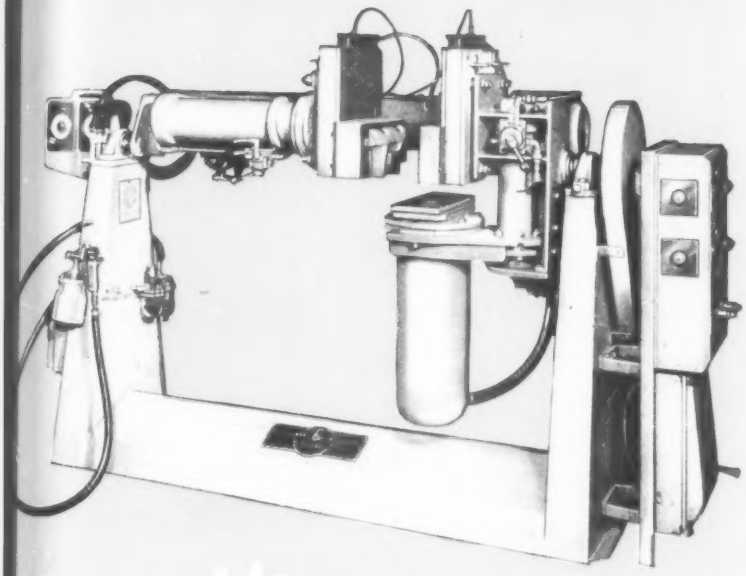
Now here-the SHALCO MCM 5 SHELL CORE BLOWER



...it is causing a major revolution in America and is now available to British foundrymen

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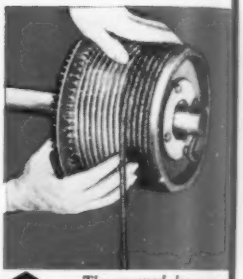

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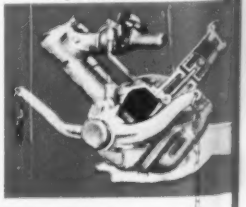

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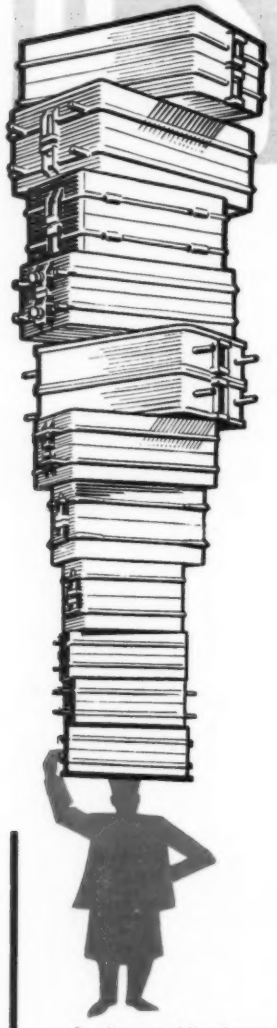

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FOUNDRY
TRADE JOURNAL
Vol. 108 JANUARY 21, 1960 No. 2250

The Writing on the Wall

There are a number of trends in metallurgical developments which are of interest to those who take a long-term view of the ironfoundry industry, one major factor being the ever-increasing use of steel scrap. Electric steel-making practice is expanding, involving the use of larger and yet larger arc-furnaces for melting, which so far have relied on steel scrap as their raw material. Some countries, themselves possessing no iron and steel industry, are envisaging the installation of rolling mills, using steel bar-end scrap as their source of raw material. The ironfounders, too, in their furnace charges have replaced much pig-iron with steel scrap.

Happily, the metallurgical industries are inventive and can adapt processes to the price and availability of raw materials. Forty years ago, for the best cylinder castings, it was usual to rely on cold-blast pig-iron—later, this was replaced by refined iron, but from the end of the 1914 war, ironfounders have been using increasing quantities of steel scrap. The time is opportune for founders to make efforts to produce the irons currently used from charges based on increasing quantities of pig-iron, so that if the market changes, they are in a position to maintain existing standards of composition and physical properties.

If present progress in the direct (continuous) casting of steel bars be accelerated, another trend meriting serious consideration will be the reduction in demand for ingot-moulds. This applies both to moulds for steel and the water-cooled variety for the non-ferrous trade. Changes in manufacturing techniques and consumer demands which are envisaged need not be too frightening, as they usually result in the use of different kinds of castings—often smaller and much more expensive than those which become obsolete.

Atomic Energy Research at Technical College

Research and development work for the United Kingdom Atomic Energy Authority is now being undertaken by the metallurgy department of the County Technical College, Wednesbury, Staffs. Dr. H. Hall, head of the department, will lead the team of research workers. This is the first time that work of such a nature has been entrusted to a technical college.

During the six months that Dr. Hall has been at the College, development work for the Atomic Energy Authority has been in progress and he suggests that the success of this is one reason for the work offered to the College being extended. He is reported as saying that "We regard the prosecution of research in technical colleges to be vital, both for its influence on teaching and for its own sake, and we hope this work for the UKAEA will increase in scope and lead to even closer co-operation with local industry in both technical investigation and pure research fields."

The principal of the College, Mr. H. A. MacColl, has said that details of the work to be undertaken could not be given as it was all "classified research," but he thought that another reason why the College had been chosen was that there were exceptional facilities for carrying out metallurgical research at Wednesbury —above the normal facilities in technical colleges. He added that the growth of the work was such that the education authority has made emergency arrangements for an additional research laboratory at the College, and this should be available within the next two months. The Wednesbury College has a national reputation for the work of its metallurgy department. In 1892 it became the first part-time institution in the country to run metallurgy classes. (Readers may remember the College's participation in this new research was featured recently in a television programme.)

BSFA at London Exhibition and Conference

The first United Kingdom Engineering Materials and Design Exhibition will be held at Earls Court, London, from February 22 to 26. The British Steel Founders Association will be participating in the Exhibition and also in the conference which is being organized to run concurrently with it. One whole day of the conference, Wednesday, February 24, will be devoted to papers and discussions sponsored by the Association. On this occasion Dr. C. J. Dadswell, BSFA chairman, will open the proceedings at 9.45 a.m., and then Mr. Frank Rowe of K. & L. Steelfounders and Engineers, Limited, of Letchworth, will present the first paper. A second paper will be given during the morning and a third in the afternoon, the session ending at approximately 3.30 p.m. For the last two papers leading figures representing steel castings users have been approached. The general theme of the BSFA papers and of their stand at the Exhibition will be "Better Value for Money," *i.e.*, propaganda stressing the technical aspects as a basis for expanding uses of steel castings.

BRADFORD'S FIRST SMOKE-CONTROL ORDER, which covers 600 acres in the Little Horton area and affects 7,000 houses, is to come into operation on October 1. Smokeless zones have already been established on the post-war Council estates of the city. These, together with the new zone, will mean that over 2,000 acres will be controlled. This is nearly a tenth of the city.

Forthcoming Events

JANUARY 23

Institution of Production Engineers

Wolverhampton graduate section: Works visit to Guy Motors, Limited, Wolverhampton.

Institute of British Foundrymen

West Riding of Yorkshire branch: Film show including "Spheroidal-graphite Cast Iron," "One Off or a Million," and "Manufacture of Spun-iron Pipes," 6.30 p.m., at the Bradford Institute of Technology (original programme cancelled owing to indisposition of Mr. T. A. Williams).

JANUARY 25

Institution of Production Engineers

Stoke-on-Trent section: "Materials Handling—A Challenge to British Industry," by A. G. Hayek, 7.30 p.m., at the Grand Hotel, Hanley.

Institute of British Foundrymen

Sheffield branch: Annual dinner at the Royal Victoria Hotel, Sheffield.

JANUARY 26

North-East Metallurgical Society

"Production and Properties of Nodular Cast Irons," by H. Morrogh, 7.30 p.m., at the Cleveland Scientic and Technical Institution, Corporation Road, Middlesbrough.

Institution of Plant Engineers

South Wales branch: "Safety in Uses of Industrial Gases and Equipment," by M. T. Reeks, 7.30 p.m., at the South Wales Engineers' Institute, Park Place, Cardiff.

Society of Instrument Technology

Symposium on "Flame Failure Detection," including "A Review of Current Flame Failure Devices," by D. H. Surgeoner, and "Applications of Flame Failure Equipment," by D. Richards, 6.30 for 7 p.m., at Manson House, 26, Portland Place, London, W.1.

Combustion Engineering Association

North Western region: "Utilization of Steam and Heat," by R. Clare, 2.30 p.m., at the Engineers' Club, Albert Square, Manchester.

JANUARY 27

Combustion Engineering Association

Scotland: Discussion on "Utilization of Waste Products," opened by H. A. Mercer, 10 for 10.30 a.m., and at 2 p.m., a discussion on "Fuel-saving Schemes," opened by R. Bunting. Meeting to be held at Royal British Hotel, 20, Princes Street, Edinburgh.

Manchester Metallurgical Society

"Theoretical Background to Corrosion," by R. A. U. Huddle, 6.30 p.m., in the Manchester Room of the Central Library, Manchester.

Institute of British Foundrymen

Birmingham branch: "Statistics and Some Foundry Problems," by I. C. H. Hughes and A. G. Fuller, 7.15 p.m., at the James Watt Memorial Institute, Great Charles Street.
London branch: Apprentices' Evening: "Bring Your Problems," with special reference to the International Apprentice Competition, compered by A. Talbot, 7.30 p.m., at the Constitutional Club, Northumberland Avenue, W.C.2.

JANUARY 28

Institution of Plant Engineers

Sheffield and district branch: "Instrumentation," by Dr. R. H. Baulk, 7.30 p.m., at the Grand Hotel, Sheffield.

Southampton Metallurgical Society

Film evening: "Grain Structure"; "Carbon Content"; and "Heat-treatment," 7.15 p.m., in the Engineering Block, Southampton University.

JANUARY 29

Institute of British Foundrymen

Falkirk section: "Some Casting Defects—their Causes and Cure," by J. L. Francis, 7.30 p.m., at the Temperance Cafe, Lint Riggs.
West Wales section: "Running and Gating of Copper-base Alloys," by W. W. Glick, 7 p.m., at Richard Thomas & Baldwins, Limited, Landore.

JANUARY 30

Institute of British Foundrymen

Wales and Monmouth branch: "Running and Gating of Copper-base Alloys," by W. W. Glick, 6 p.m., at the Engineers' Institute, Cardiff.

Specification Requirements for Gunmetal Castings

*By F. Hudson, F.I.M., and E. C. Mantle, M.Sc., F.I.M.**

The revision of specification B.S. 1400 for copper-base castings has been causing much controversy recently, particularly between founders and ingot manufacturers. In view of this, the IBF London branch held a meeting to examine some of the problems involved—members of the Association of Bronze & Brass Founders, and the British Bronze & Brass Ingot Manufacturers' Association, were invited. The speakers dealt with such matters as: future outlook for gunmetal castings, specification details, test-bars, properties of castings, inspection methods and hallmarking of quality castings.

At a meeting in the Autumn of 1959 of the London branch of the Institute of British Foundrymen, short papers on the subject of "Gunmetal Specifications" were presented by Mr. F. Hudson, F.I.M. (a past-president of the branch) and Mr. E. C. Mantle, M.SC., F.I.M. These are reproduced in what follows, together with abstracts from the discussion which ensued. The chairman for the meeting was Mr. D. A. C. Hutchison, senior vice-president of the branch, who deputized for Mr. J. Bain, the president. Before inviting the lecturers to proceed, Mr. Hutchison welcomed visitors to the meeting, mentioning Mr. J. Vanick from the United States and members of the Association of Bronze & Brass Founders and the British Bronze & Brass Ingot Manufacturers' Association, all of whom were invited to take part in the discussion.

MR. HUDSON'S CONTRIBUTION

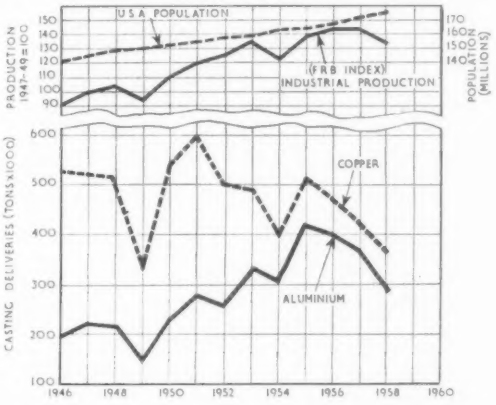
The activities of the Institute of British Foundrymen are mainly concerned with technical developments relating to production, and one is apt to overlook the rather obvious fact that the ultimate objective of every foundry is to make a profit. To do this the founder must get orders for castings, and the success achieved largely depends upon the finished product and the marketing methods employed. Markets change rapidly in this modern world, and marketing methods must change with them if a firm is to survive and maintain a competitive position in its industry. Every foundry must evolve a progressive and realistic marketing plan, which should include the organized and systematic development of new markets and better serving of present markets. If this is not realized, then the outlook may become similar to that of the brass and bronze founder who dreamed that his competitors had moved ahead of him—when he awoke they had!

Outlook for Copper-base Alloy Castings

At the moment, the outlook for copper-base alloy castings in the United Kingdom is not at all satisfactory, and is even worse in the United States.

United States

Recent statistics published in the USA by Barbour[1] (see Fig. 1) indicate that the population and index of industrial production have risen steadily since 1946, but the production of copper-base alloy castings has declined. Furthermore, the rate of decline is now even more rapid than the rate of increase in population and industrial production. Aluminium-alloy casting production, on the other hand, has risen steadily, in keeping with the increase in population and the economy in general. It is evident that every man, woman and child, in the United States is using more aluminium and



(Courtesy: A. R. Barbour)

FIG. 1.—*Graphs showing the output of copper- and aluminium-alloy castings in the USA in relation to population and index of industrial production.*

fewer brass and bronze castings as the years go by. To overcome the decreasing consumption of copper-base alloy castings in America, Barbour recommends that this section of the foundry industry must find, through research, new applications for its products, and must improve quality, stabilize its prices, and intensify its sales effort. In this connection, it is interesting to note that the marketing

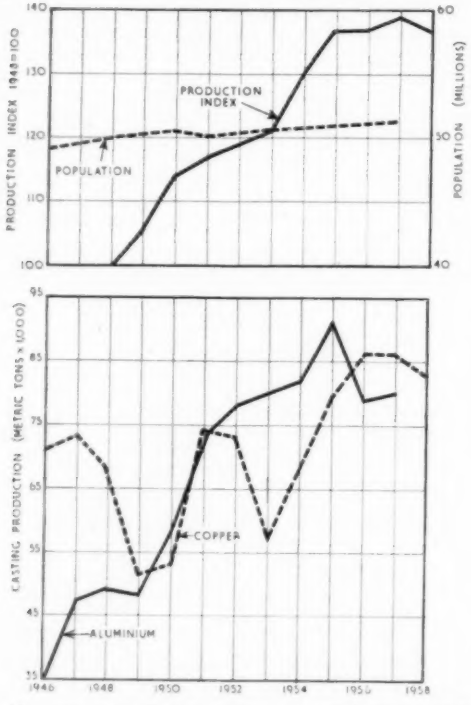
* Mr. Hudson is attached to the research and development department of the Mond Nickel Company, Limited, and Mr. Mantle is chief liasion officer of the British Non-Ferrous Metals Research Association.

Specification Requirements for Gunmetal Castings

programme of the Non-ferrous Founders' Society has been launched with the release of an alloy specification, a property chart, and the first two of a series of case histories illustrating particularly successful applications of copper-base alloy castings.

United Kingdom

Comparative statistics, based upon information supplied by the British Bureau of Non-ferrous Metals Statistics and the Association of Bronze and Brass Founders, for the production of copper- and aluminium-base alloy castings in the United Kingdom are shown in Fig. 2. It would appear that so far there has been no decline in the overall output of copper-base alloy castings in this country but the improvement in production since 1946 is small indeed compared with that obtained in the light-alloy field. It is evident that the production



(Courtesy: the British Bureau of Non-Ferrous Metals Statistics, and the Association of Bronze & Brass Founders)

FIG. 2.—*Output of copper- and aluminium-alloy castings in the UK in relation to population and index of industrial production.*

of aluminium-base alloy castings is growing more rapidly than either the population or the economy in general. This is no doubt largely due to the progressive outlook and excellent research, development, and sales promotion activities of the principal producers of light alloys.

Comparison of US and UK

A comparison of the amount of copper- and aluminium-alloy castings used per person in the USA and UK is provided in Table 1. During the

TABLE 1.—*Comparison of the Amount of Copper- and Aluminium-alloy Castings used per Person in the USA and UK* (1946 and 1957).

Alloy.	Amount used per person (lb.).		Trend.
	1946.	1957.	
UK:			
Copper-base alloy castings ..	3.0	3.3	+ 10 per cent.
Aluminium-base alloy castings	1.4	3.1	+ 121 per cent.
USA:			
Copper-base alloy castings ..	6.9	4.5	− 35 per cent.
Aluminium-base alloy castings	2.3	3.8	+ 65 per cent.

period 1946 to 1957 the production of copper-base alloy castings in the United Kingdom rose by only 10 per cent., less than 1 per cent. per year. The expanding production of valves and plumbing fittings during this period, to meet new housing requirements, would more than absorb this increase, which suggests that the British brass and bronze foundry industry in general may also be in a declining trend. In the same period the production of aluminium-alloy castings increased by 121 per cent. Another fact worth noting is that, although the production of the American brass and bronze foundry industry has decreased by 35 per cent. since 1946, the amount of copper-base alloy castings used per person in 1957 is still 36 per cent. higher than in Great Britain. What can be done about this situation in the brass and bronze foundry industry? Are founders to sit tight and wait for the position to get worse, or are they going to try to develop a new outlook in order to improve matters?

Reasons for Decline

One can, of course, give many reasons for this declining trend. One of these is the replacement of bronze bearings by steel ball and roller bearings, nylon and aluminium-base alloys. Another is that plastics have displaced brass castings for ornamental hardware on furniture and other household fittings. Aluminium castings have made great inroads in the architectural field. Stainless-steel castings are replacing gunmetal and bronze for corrosion-resisting applications in food and chemical plant, etc. In many of the instances just mentioned, a better or more economical product has replaced brass and bronze castings. This sort of loss is the result of progress, and can only be counteracted by the adoption of similar methods to those put forward in the USA, namely, that the brass and bronze foundry industry must: (*a*) find, through research, new applications for its products, (*b*) improve quality, (*c*) stabilize its prices, and (*d*) intensify its sales effort. In this paper it is only proposed to deal with the first two of these four points, and the relation they bear to specification requirements for gunmetal castings. Matters concerning price and marketing do not come within the activities of the IBF, and must accordingly be left for consideration by the trade associations concerned.

Specifications are Essential

Specifications are essential for the control of quality in gunmetal castings, and also as a source of reference for the designer. Without them it is impossible to develop new applications. The right kind of specification can also be a useful sales asset. In the changing world of to-day specifications soon get out of date, and they must be revised from time to time to meet the needs of the future. British Standard Schedule 1400:1948, covering copper-alloy ingots and castings, has reached this stage, and the proposed revision has given rise to some controversy. Founders must try to resolve this controversy, and in doing so keep in mind two very important facts. Firstly, it must be appreciated that British Standard Specifications are specifically drawn up to meet the overall present and *future* needs of a large number of users, with many different requirements, as well as for the benefit of the brass and bronze foundry industry itself. Secondly, they reflect the standing of British goods in world markets, and consequently the position of our export trade.

Impurities

The question of impurity limits is probably the main centre of controversy so far as the revision of BS 1400 is concerned. For some time certain American and Continental gunmetal specifications have included detailed impurity limits, and the omission of these from equivalent British specifications reflects unfavourably on our products. Obviously the UK founders cannot afford to remain in such a position, and the introduction of detailed impurity limits in the revised draft of BS 1400 is a step that cannot be avoided.

It has been suggested that the introduction of such limits is not practical, due to the absence of suitable analytical methods, and that they will increase metal costs. If this is so then why have the Americans, Germans and Belgians included detailed impurity limits in their gunmetal specifications? It is of course possible that the British Standards committee responsible for the present revision of BS 1400 were too enthusiastic, and applied detailed impurity limits to certain specifications where they were not really needed. Maybe it is in the way the revised specification has been phrased.

Wording of Specifications

In this connection it is interesting to note that in the American ASTM gunmetal specifications the presence of impurities is covered by the statement: "Analysis shall regularly be made only for the elements designated in boldface type (copper, tin, lead, nickel). However, the presence of the other named elements outside of the limits specified *shall constitute cause* for rejection (zinc, iron, antimony, sulphur, aluminium, silicon and phosphorus)." Obviously one need not analyze for impurities, and even if they are present in excessive amounts this may not necessarily lead to rejection. In comparison, the wording of the revised British specifications reads: "The supplier shall undertake that the material does not contain other impurities in excess of the amounts stated." In other words the estimation of impurities is mandatory, and if they are present in excess then the material can be rejected. It is possible that re-examination of the impurity problem along the lines suggested may help to resolve the controversy which has arisen around this particular point.

Before leaving the subject of impurities it might be as well to correct the impressions of those who are still inclined to look upon nickel as a deleterious element in gunmetal. Such views are, of course, completely wrong, as ample evidence is now available to show that nickel additions play an important part in promoting casting quality, particularly so far as the leaded gunmetals are concerned.

Simplification

Simplification, standardization, and specialization, play an essential part in the economy and productivity of every industry. There has been some criticism of the revised draft of BS 1400 because the number of alloys has been increased. If it were possible to reduce the number of alloys this would be of considerable benefit to the brass and bronze foundry industry.

In the author's opinion only three grades of gunmetal are needed to meet the majority of industrial requirements:

(1) A low-priced and easily-cast alloy, with a tensile strength of not less than 11 tons per sq. in., for the production of small thin-sectioned castings (for use at atmospheric temperature) which have to withstand hydraulic test-pressures up to 200 lb. per sq. in., such as domestic taps, plumbing fittings, etc. Present and future requirements in this field can be successfully met by the use of LG1 leaded gunmetal (83/3/9/5).

(2) A medium-priced and easily-cast alloy, with a tensile strength of not less than 13½ tons per sq. in., for the production of thin- and medium-sectioned castings (for use at atmospheric and elevated temperatures up to 288 deg. C) which have to withstand hydraulic test-pressures up to 1,000 lb. per sq. in., such as valves, pumps, and other general engineering castings. Present and future requirements in this field can be successfully met by the use of LG2 leaded gunmetal (85/5/5/5).

(3) A reasonably-priced and easily-cast alloy (with a tensile strength of not less than 15 tons per sq. in.) for the production of quality castings of all sizes and sections (for use at atmospheric and elevated temperatures up to 288 deg. C) which have to withstand hydraulic test-pressures above 1,000 lb. per sq. in. Present and future requirements in this field can be economically met by the use of improved leaded-gunmetals, such as those developed by the British Non-Ferrous Metals Research Association and the Mond Nickel Company, Limited. Only slight modification of the revised specification for leaded gunmetal LG3 (87/7/4/2) is required to meet these latest developments, and the improved alloy could well replace G1 (88/10/2), G2 (88/8/4), and the proposed "higher grades" of LG2 and LG3.

Specification Requirements for Gunmetal Castings

Improved Leaded Gunmetal

A brief account of the latest results obtained in the Mond Nickel laboratories may not be out of place here. It has been found that, by the use of a leaded gunmetal containing around 6½ per cent. tin, 3 per cent. zinc, 3½ per cent. lead, 2 per cent. nickel, remainder copper, it is possible to produce castings of variable section having mechanical properties similar to those obtainable from 88/10/2 gunmetal, combined with the castability and pressure-tightness normally associated with 85/5/5/5 gunmetal. The effect of section-thickness and design on the tensile strength of fully-fed sand castings made in this gunmetal is shown in Fig. 3. Although in sections less than 3 in. thick its tensile

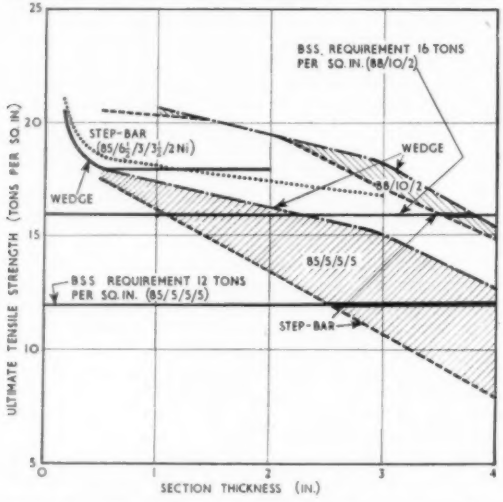


FIG. 3.—*Diagram showing the effect of section thickness and design on the ultimate tensile strength of sand castings made in the improved nickel-containing gunmetal, in comparison with* 88/10/2 *and* 85/5/5/5 *standard alloys.*

strength is not quite as good as that of the more expensive 88/10/2 alloy, the slightly better properties of the latter are more than offset by the difficulty of producing pressure-tight castings. In sections over 3 in. thick, the tensile strength of the improved gunmetal is as good as, or better than, that of 88/10/2. It is also evident that the improved alloy gives a more uniform level of properties in castings of variable section. Furthermore, the properties of castings can be related to those obtained from separately-cast test-bars. The tensile strength of castings made from this alloy should be about 18 tons per sq. in. in separately-cast test-bars, and not less than 14 tons per sq. in. in fully-fed sections of up to 4-in. thickness.

High Proof-stress

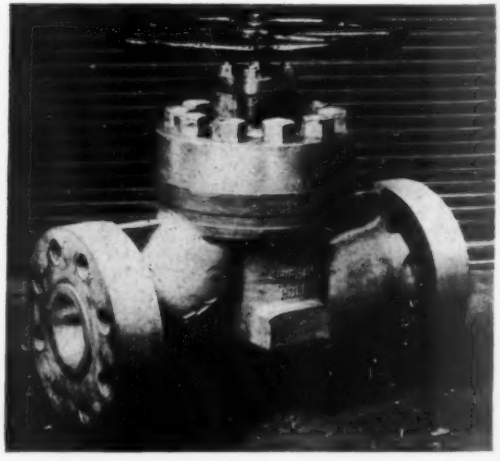
The most significant property of this improved gunmetal, and probably the most important from the designer's point of view, is its high proof-stress. Not only is the 0.1 per cent. proof stress greater than 8 tons per sq. in. (a value higher than that for any of the standard gunmetals), but also this high level is maintained in sections up to at least 3 in. thick. The elongation of the improved alloy in all cases exceeds 20 per cent. and is considered to be adequate for all applications. It is stable and not subject to age-hardening when used at elevated temperatures. Creep tests, not yet completed, indicate that the improved gunmetal will probably be equal to, or slightly better than, the 86/7/5/2 or 85/5/5/5 alloys.

Quality Castings easily produced

Quality castings, of uniformly high strength and pressure-tightness, can be more easily produced from this improved gunmetal than from any of the standard gunmetals. Actual foundry trials, of the production of castings which have proved difficult to make in the standard alloys, have provided ample confirmation of this fact. For example, the large valve shown in Fig. 4 is employed for handling liquid oxygen for fueling guided-missiles. This valve, weighing 2,408 lb., and having sections varying from 2½ to 5 in. thick, must withstand a test pressure of 5,200 lb. per sq. in. air. Admiralty gunmetal was originally specified, but all the castings made leaked under test at pressures well below the level required. Requirements were satisfactorily met by the use of the improved gunmetal (containing nickel). Many similar production case-histories

FIG. 4.—*Large gunmetal valve for handling liquid oxygen. This valve, weighing* 2,408 *lb. and having sections varying from* 2½ *to* 5 *in. thick, is required to withstand an air-pressure of* 5,200 *lb. per sq. in. without leakage. Admiralty gunmetal* (88/10/2) *was originally specified, in view of the very heavy sections involved, but all castings leaked at pressures well below the level required. Requirements were satisfactorily met by the use of the improved gunmetal containing nickel.*

(Courtesy: Shipham & Company, Limited)



are available, and a full account of this development will be very shortly published in the technical press.

Standardization is Advisable

All the standard gunmetals in use to-day have been evolved by trial and error, and, as a result of the work being done by the BNFMRA and Mond Nickel, specifications will have to be modified to enable the brass and bronze foundry industry to find new applications for its products, and to improve quality. In view of these new developments, consideration should be given to the ultimate removal of G1 (88/10/2), G2 (88/8/4), and the proposed higher grades of LG2 (85/5/5/5) and LG3 (87/7/4/2) from British Standard specifications. It may not be possible to dispense with 88/10/2 and 88/8/4 gunmetals from the present revision until international agreement is obtained, in view of the adverse effect this may have on the export market. It should, however, be clear to all that if it were possible to standardize on three grades of leaded-gunmetal with a similar basic composition, such as LG1 (83/3/9/5), LG2 (85/5/5/5) and a slightly modified form of LG3 (87/7/4/2), this would be of great benefit to the industry as a whole.

Casting Quality

The value of specifications is greatly increased if they can be related to the products they are supposed to represent. Designers and users of gunmetal castings, particularly when new applications are involved, obviously want some idea of the properties to be expected from the casting itself rather than from separately-cast test-bars. The fact that such information has not been available in the past may to some extent account for the decline of copper-base alloy casting production in the USA, and the doubtful position of the industry in Great Britain. The introduction of improved gunmetal compositions with: (*a*) good castability; (*b*) low sensitivity to the effect of section thickness; and (*c*) a level of mechanical properties related to those obtainable from separately-cast test-bars, and which will economically produce pressure-tight castings, should help to improve the outlook for the future.

Reluctance to assume Responsibility

The brass and bronze foundry industry in general has been reluctant to assume responsibility for either design or quality. This attitude is not in keeping with progressive marketing methods. Such responsibility brings about an engineering maturity which classifies castings as products, rather than as bulk materials. The foundry industry must assume responsibility for both design and quality in order to capture new applications and meet the needs of the future. To do this effectively one must have greater knowledge of the properties of castings, and how such data is related to that obtained from separately-cast test-bars. A data book giving such information would be invaluable to the designer.

It must, however, not be forgotten that the introduction of revised specifications covering improved gunmetal compositions is only the first step in the ultimate development of quality castings. In order to ensure that the required standard of casting quality is consistently obtained, a proper system of quality control, and hall-marking of good castings, is also essential. (The views of the author on these matters have been reported elsewhere[2] at some length, and it is therefore not proposed to deal with them in this paper.)

Conclusion

In conclusion, it may be said that the author is of the opinion that the present revised draft of BS 1400 is not as good as it could be to meet the needs of the future, but that it is certainly an improvement over the specifications in use at present. With a little further thought and consideration it should be possible to satisfy the requirements of all concerned.

REFERENCES

[1] A. R. Barbour, *Foundry*, September, 1959, **87** (No. 9), 143-148.
[2] F. Hudson, *Metal Industry*, May 22, 1959, **94** (No. 21), 417-420.

MR. MANTLE'S PAPER

The subject of specifications has provoked so much more comment than anything happening in the bronzefoundry industry for a long time, that overseas readers of UK foundry journals might be forgiven for thinking that British founders are indeed back in the Bronze Age. It is not the purpose of this short paper to add to the controversy by making comments on the revision of BS 1400 which is in progress at the moment. Instead, it is intended to give a brief account of three research programmes, at present in progress at the British Non-Ferrous Metals Research Association, which have a bearing on gunmetal specifications. The results of this work will no doubt be taken into account by the appropriate British Standard committee, and in the drawing up of International Standards. For convenience of reference to the alloys, the nomenclature used in the 1948 edition of BS 1400 will be used.

Choice of Alloys

It is well known that there are marked differences in the ease with which pressure-tight castings can be made from the various gunmetals listed in BS 1400, but no systematic work has been done on the relationship between chemical composition and the degree of porosity. To determine what would be the best composition to give minimum porosity, an investigation was made into: The effect of the major alloying elements (copper, tin, zinc and lead) on all the properties of gunmetals, including the tensile strength both of test-bars and of sections of different thickness; porosity and strength in unfed sections as found in many commercial castings; pressure-tightness of the alloys, and creep properties at the temperature of superheated steam. A brief examination was also made of the resistance of gunmetal to corrosion by seawater.

It was found possible to draw a series of contour diagrams in which one property (*e.g.*, tensile

Specification Requirements for Gunmetal Castings

strength, elongation or pressure tightness) was plotted against variations in percentage composition. By making very many alloys, testing their properties and drawing a series of contour diagrams, it was discovered that suitable alloy compositions could be selected for any desired property, or, what is more important, an alloy composition could be predicted (designated BNF Gunmetal) which would give the best all-round combination of pressure-tightness, strength, resistance to creep and so on. The main results of this research are summarized in Tables 1 to 4.

TABLE 1.—*Properties of Test-bars made from Various Gunmetals.*

	G1	LG2	LG3	BNF gunmetal.
Tensile strength (tons per sq. in.)				
High casting-temperature ..	21.5	17	19.5	20
Low casting-temperature ..	16.5	14	14	17
Elongation (per cent on 2 in.)				
High casting-temperature ..	35	40	43	50
Low casting-temperature ..	17	21	17	25
0.1 per cent proof stress* (tons per sq. in.)	10	6½	7	8

* Note.—The 0.1 per cent proof-stress value is relatively independent of the structure of the casting, and for normal applications forms a better basis for calculation of design stresses than the tensile strength.

Properties of Existing Gunmetals

For most purposes, the old favourite LG2 (85/5/5/5 leaded gunmetal) proved to be as good as or better than any other alloy. Although LG2 has not the best test-bar properties, the strength in poorly-fed sections, typical of many commercial castings, is good, and it has excellent pressure-tightness. Furthermore, its creep-resistance at 288 deg. C., the highest temperature permitted for gunmetals in valve specifications, is better than that of any of the other alloys tested. "Creep-resistance" is defined

TABLE 2.—*Properties of Castings made from Various Gunmetals.*

	G1	LG2	LG3	BNF gunmetal.
Tensile strength (tons per sq. in.)				
At changes in section, etc. ..	15	10	11	13
At 2-in. to 3-in. sections ..	12½	10	11	14
Elongation (per cent)				
At changes in section, etc. ..	13	10	15	25
At 2-in. to 3-in. sections ..	15	15	20	30

as the ability of the material to withstand prolonged loading at the temperature of test with minimum distortion—a commonly used criterion is that stress causing not more than 0.001 in. per in. extension in 10,000 hr. at temperature. Good creep-resistance is important for applications such as steam valves and parts of heat exchangers.

LG3 (86/7/5/2 gunmetal), claimed to be a superior grade to LG2, although having slightly better test-bar properties, is worse than LG2 in all other respects. In fact, it proved to be one of the most unsuitable compositions one could choose for the general run of pressure-tight castings. Although it is often specified for steam valves, its high-temperature properties are, in fact, no better than those of LG2.

G1 (Admiralty gunmetal) is poor in most respects, with the exception of test-bar properties. It is a particularly difficult alloy to make pressure-tight, but the casting qualities can be much improved without loss of strength by adding 1 per cent. of lead, though this puts it outside the existing BS 1400 specification.

TABLE 3.—*Degree of Pressure Tightness obtained from Various Gunmetals.*
Good pressure tightness—1
Poor pressure tightness—3

	G1	G1 + 1 per cent Pb	LG3	LG2	BNF gunmetal.
High casting-temperature	3	2	2	1	1
Low casting-temperature or thicker sections	3	2–3	2	1	2

BNF Gunmetal

In the course of the work, one percentage composition was found which seemed to give better all-round properties than any of the alloys mentioned so far. This approximated to a nominal composition of 87½ copper, 7½ tin, 2 zinc and 3 per cent. lead. For want of a better term, this has been called BNF gunmetal. This alloy gives test-bar properties almost as good as G1, shows a minimum of porosity in poorly-fed sections, and has particularly good strength in heavy sections (where

TABLE 4.—*Creep-resistance (Stress (lb. per sq. in.) to cause 0.1 per cent Plastic Strain in 10,000 hr.) of Various Gunmetals.*

	G1	LG2	LG3	BNF gunmetal.
At 232 deg. C.	2,200	4,000	3,800	2,700
At 288 deg. C.	7,500	10,000	9,000	7,500

it is better than either LG2 or G1). Although it is not quite so good for making pressure-tight castings as LG2, it is considerably better than the other alloys. It could certainly replace LG3 in those few applications where LG2 is not considered good enough, and could largely, if not entirely, replace Admiralty gunmetal.

Work is continuing with an examination of the effect of nickel additions, and the results already obtained go some way to confirming those obtained by Mr. Hudson. However, it is not yet clear whether Mr. Hudson has already found the best possible combination of elements, or whether further experiments might reveal an even better nickel-containing alloy.

Impurities

There seems to be a great deal of confused thinking on impurities, and it clarifies the position a lot if the question is dealt with under two headings. First, what impurities affect the production of the castings, since clearly these impurities should not be present in the ingots; secondly, what impurities affect the properties of the castings—

strength, machinability and corrosion resistance, for example—since these ought to be limited in the casting specifications?

Aluminium

It is generally recognized that, for the production of pressure-tight castings, aluminium is particularly deleterious. Several years ago the BNFMRA did work which showed that even traces of aluminium as small as 0.005 per cent. had a detectable influence on the ease with which pressure-tight castings could be made from gunmetals. Hence, if the alloys are to be used for making pressure-tight castings, it seems essential that there should be a tight limit on the aluminium content of the ingots. Probably 0.005 per cent. is an impracticable limit to set, but it is quite clear that not much more than this can be tolerated.

Silicon and Sulphur

It is also known that silicon is a harmful impurity in leaded gunmetals, since small amounts of it tend to accentuate metal/mould reaction, thus causing gas pick-up which affects pressure-tightness and strength. Here again, there are good grounds for restricting the silicon content of the ingots. At one time it was thought that sulphur was a harmful impurity, and this was investigated very thoroughly at the BNFMRA. No harmful effects attributable to the presence of sulphur in amounts up to 0.25 per cent. could be found, however, and there seems no reason why sulphur limits should be imposed.

Conclusions arrived at

At the moment, the effects of antimony, arsenic, bismuth and iron are being similarly investigated and, although this work is not quite complete, again it seems from the results obtained that none of these elements, with the possible exception of iron, has much effect on the production of castings when present to the maximum likely to be found in commercial gunmetals. To summarize the position as regards impurities in ingots, it seems as though one is justified in limiting the silicon content of leaded gunmetals, though it may not be important in lead-free gunmetals. One may also be justified in limiting the iron content, though insufficient work has been done to be certain of this, and it is certainly necessary to limit the aluminium content when, and only when, the material is to be used for making pressure-tight castings. For other castings, the presence of aluminium is unlikely to be harmful. However, there are obvious difficulties over segregating gunmetal to be used for, say, valve work, from that to be used for bearing shells.

Influence on Casting Properties

Turning to the effects of the impurities on the properties of the castings themselves, with the possible exception again of iron (which may affect the machinability of the gunmetals), it seems unlikely that any of the common impurities, in the quantities normally found in commercial gunmetals, will have any noticeable effect. There does not seem to be much point, therefore, in having tight limitations on impurities in castings as, generally, foundry variables such as the melting and casting practice will have a far greater effect. If this is realized, it should greatly simplify the drafting of specifications.

Test-bars

If mechanical properties are to be specified, then clearly the casting on which these mechanical properties are to be determined should be also specified, since it is well known that the properties from a given alloy will vary tremendously with the type of casting. The work carried out at the BNFMRA in recent years makes it clear that the matter is even more complicated than this, since with many test-bar designs one can get entirely different properties according to the casting temperature and the way in which the test-bar is poured. Both of these factors affect the type of grain-structure obtained, which has a profound influence on the distribution of porosity, and hence also on strength. Recently, an extensive investigation was made to try to find a design of test-bar which would help to eliminate these variables, and which would give consistent results from foundry to foundry. The answer has been found in the enlarging of the feeders of what has come to be known as the FBF test-bar (that is, a shaped test-bar cast singly with a larger feeder at each end). By ensuring that this test-bar is cast at a reasonably high temperature, and poured as rapidly as possible, very consistent results are obtainable with 85/5/5/5 gunmetal. However, the bar is still reasonably sensitive to melt quality (that is, the gas content of the metal), and is still suitable as a check on the foundry's melting practice.

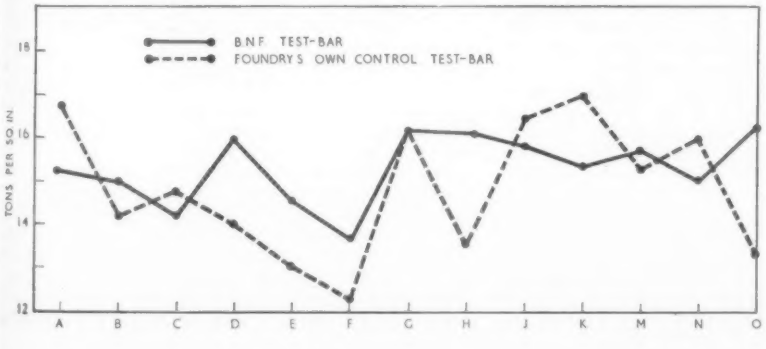


FIG. 5.—*Comparison of the tensile strengths obtained by various foundries in tests with the BNF test-bar, with strengths obtained from test-bars of the foundries' own patterns.*

Specification Requirements for Gunmetal Castings

Industrial Trials

Industrial trials of this test-bar were organized in collaboration with about twenty member firms, who made the bars from six production melts of 85/5/5/5 gunmetal chosen at random, and at the same time cast their usual test-bar, so that the properties obtained from the two types of bar could be compared. Examination of these results has enabled the graph shown in Fig. 5 to be prepared, in which the tensile strengths obtained by the various foundries with the BNF test-bar are plotted alongside the strengths obtained with test-bars of their own pattern. Many of these bars were of the type known as the BSI test-bar, specified in the existing BS 1400. It can readily be seen from the diagram how much more consistent are the results obtained with the BNF bar, and so this is strongly recommended as the bar to use for standardization. In this industrial trial, five out of every six bars cast to the BNF pattern by all the foundries co-operating, gave over 14½ tons per sq. in. tensile for production melts of 85/5/5/5 gunmetal. BS 1400, 1948, calls for only 12 tons per sq. in.

Conclusion

It is hoped that enough has been said to make it clean that, by systematic and careful research work, the drafting of specifications can be tackled on sound technical lines which will benefit: (*a*) the consumer, by giving higher quality castings; (*b*) the foundryman, by ensuring that the alloys called for have the best casting properties, and (*c*) the ingot-makers, by reducing the number of alloys, and eliminating compositions requiring unnecessarily high-purity raw-materials.

DISCUSSION

MR. A. TALBOT (past-president, London branch) said Mr. Hudson had set the meeting thinking of nickel, especially when he had illustrated the large gunmetal valve. Would Mr. Mantle be prepared to say that the BNF gunmetal would have produced that valve just as well and, if so, would it have been a cheaper job?

MR. MANTLE replied that the British Non-Ferrous Metals Research Association had not yet done sufficient work to prove that the nickel-containing gunmetal was better than their BNF alloy. One would probably find that each had its particular field of application. Mr. Hudson was substituting 1 per cent. of nickel for 1 per cent. tin, and 1 per cent. nickel for 2 per cent. copper in his gunmetal, and that should not have a very great influence on the price of the alloy. However, the Research Association would like to do a lot more work in order to resolve the question.

MR. HUDSON said it was necessary to look upon the investigations conducted by the BNFMRA and the Mond Nickel Company, Limited, as being complementary. The BNFMRA had investigated the effect of essential base-elements in order to give the founders a better gunmetal for the production of castings. The Association had not investigated the effect of nickel in the initial stages of their work and they had concluded that an alloy containing 7½ per cent. tin, 2 per cent. zinc and 3 per cent. lead was the best combination for producing high-quality castings, where good mechanical properties as well as pressure-tightness were needed in castings of variable section. Mond Nickel, on the other hand, had investigated the effect of nickel and had found that they could modify the base elements, reducing the tin content from 7½ to 6½ per cent., which gave the opportunity to use more zinc (3 instead of 2 per cent), and a little more lead (3.5 instead of 3 per cent.). Obviously, it was advantageous to keep the lead content as high as possible in gunmetal in view of the effect of this element on pressure-tightness, and the nickel was added to counteract the effect of the lower-tin and higher-lead contents on mechanical properties. He was sure that when the BNFMRA had completed their further work in exploring the effects of nickel, they would probably arrive at the same conclusion. The initial metal cost of the two alloys would be about the same.

MR. J. P. WEBSTER suggested that, as indicated by the graph which Mr. Hudson had shown, the reduced demand for copper-base castings should have been related to the variation in the price of copper. It would then be found, he thought, that founders were not so much at fault as were the copper producers. When one noted that some of them had a revenue of £40 million, of which £21 million was profit, one felt that if founders worked on the same lines, they would be accused of profiteering. The difficulties with which the foundry industry had to cope did not always lie at its own door, but at the door of the suppliers of raw materials.

MR. HUDSON said that he sympathized very much with Mr. Webster. He urged that the industry had got to do something to stabilize prices, and he considered that copper was one of the factors which had to be considered in this direction.

Columnar Structure

MR. D. MORRIS said that 88/10/2 gunmetal usually had a columnar structure with, very often, centre-line porosity. He asked if that fault were eliminated in the improved nickel-containing gunmetal in sections up to ¼-in. thickness.

MR. HUDSON replied that the improved nickel-containing gunmetal seemed to be less sensitive than the 88/10/2 gunmetal towards the formation of columnar structures and centre-line porosity in sections up to ¼-in. thickness. At the moment, further investigations were being done on the effect of pouring temperature, rate of solidification, etc., to obtain information on these matters.

MR. R. BLANDY expressed his interest in Mr. Mantle's reference to relating gas content to test-bar properties. He asked whether the gas content should be as low as possible, or whether it was better to have a certain quantity of gas in the alloy, as was the case for certain casts of aluminium.

MR. MANTLE said it was rather difficult to control the gas content of an alloy by melting procedure.

One should aim to produce molten metal with a minimum gas-content, and if one wanted to make use of gas to control porosity, one should effect the gas absorption by controlling the phosphorus content of the alloy or by changing the pouring temperature.

MR. J. P. WEBSTER asked if all the research was done on pure metals rather than on materials of scrap origin and whether the metals were definitely mixed to a specification from virgin materials, or just controlled by analysis.

MR. MANTLE said the alloys used for the work on the effects of the major constituents on gunmetal were obviously made from virgin metal, because the investigators concerned were studying the effects of individual alloying elements. That was the case also in the work on impurities, but they were now adding two or three impurities together in order to determine their effects collectively. The work on test-bars was done with commercial 85/5/5/5 gunmetal. Ingots of commercial quality were obtained from reputable ingot manufacturers. Obviously, with others collaborating in the trials, they could use commercial metal from various sources.

MR. HUDSON, without wishing the meeting to refrain from criticizing the views of Mr. Mantle and himself, said they would like to hear the individual views of founders and ingot makers on the revised BS 1400 specification. If there was no discussion on this matter, it might be concluded that they were in agreement with it.

Education of Designers?

MR. J. P. WEBSTER said he frankly did not think that designers knew half as much about castings as did foundrymen. They made a design and left it to foundrymen to produce a casting. He considered that education of the designers was one of the things most required.

MR. HUDSON, whilst sympathizing with the thoughts of the last speaker, said that candidly he felt that the design situation was very largely the foundryman's own fault, because the majority of foundrymen knew very little about the properties of the castings they produced. A founder should be a specialist on castings, and should be able to advise the designer on the properties he could expect in the casting.

Financial Backing for Research

MR. W. R. BUXTON said the brassfounding industry was represented by the Association of Bronze & Brass Founders, but he believed that only 35 per cent. of that Association belonged to the Research Group which subscribed to the BNFMRA. That was where the subscription for bronze and brass foundry research came from. The ABBF was about 120 strong, but there were many other foundries in the country. Exactly what percentage of the castings produced in the country were made by ABBF members was a matter open to debate, but it was said to be very high—in the region of 85 per cent.—but he was not quite sure of the figure. He felt that they ought to pay their way for more research; if they were to do this, they must get all the members of the ABBF, and the British Bronze and Brass Ingot Manufacturers' Association, to subscribe.

MR. A. R. PARKES said he had attended, earlier that evening, a high-level Press conference when Lord Hailsham (the new Minister concerned with science) had outlined the policy for increasing this country's scientific effort. He had talked of the effort being put into atomic energy, space research, guided missiles, and other programmes, and then—it seemed as almost as if it were a poor relation—he had referred to the work which the Department of Scientific and Industrial Research was doing in conjunction with the various research associations. When asked what extra finance was going to be made available for the research associations engaged on DSIR-sponsored work, the Minister had said that here the matter was in the hands of industry itself; it was up to particular industries collectively to ask for more money from the DSIR according to the amount of money collected from the industry itself. In other words, the push had got to come from the industry. Mr. Parkes said he felt the lack of expanded government backing for industrial research was lamentable.

Effect of Impurities

MR. HANNAFORD said he was on the side of the ingot manufacturers, and he had attempted to carry out a little work on impurities. He was very interested to learn from the report of the BNFMRA on their new gunmetals that the level of impurities was quite reasonable. He asked if the impurity level in Mr. Hudson's nickel-containing gunmetal was the same as that reported by Mr. Mantle. In a comment on the work done in connection with the revision of BS1400, he expressed his personal view that specifications in this country were much "tighter" than they should be.

MR. MANTLE, commenting on phosphorus content, said that in his paper, he was not being critical of the ingot manufacturers in this respect, but had merely pointed out that phosphorus perhaps was not considered an impurity in ingots, and he felt it was something which foundrymen, and not the ingot manufacturers, ought to control. He did know that many ingot manufacturers were up against the difficulty that they supplied ingots to foundry people who did not recognize the necessity to de-oxidize before pouring. The ingot industry said they could overcome the difficulty only by supplying foundries with ingots having fairly-high phosphorus content, otherwise their ingots would all be gaseous. He still believed that foundrymen should control the phosphorus content.

MR. HUDSON said that in his paper he had not said anything about the effect of impurities, but had left the matter to Mr. Mantle, except that he did consider it to be essential to have something in our specifications regarding the level of impurities, in order to meet foreign competition. The Americans, Germans, and Belgians had impurity limits in their specifications, and the buyers of castings, seeing those limits, naturally thought that castings from these countries were better than ours. He had put

forward the suggestion that for most practical purposes, it only seemed necessary to specify detailed impurity limits in the ingot specification, because the impurities had an effect on castability, but not very much on the mechanical properties of the castings. Impurity levels for the improved nickel-containing gunmetal should be similar to those specified for the standard leaded-gunmetals.

MR. BLANDY, commenting on the revision of BS 1400 said that 99 per cent. of the castings which small founders had to produce were ordinary commercial castings and they were seldom, or never, asked for castings of high properties. Therefore, it did not really affect them to any great extent; it was only when there was a war that they had to produce to exacting specifications.

Are Exacting Specifications Necessary?

MR. HUDSON said he felt very strongly that the industry must make an effort to create new markets and to develop new applications for copper-base alloy castings. The large valve for handling liquid oxygen provided a good example of what could be done in this direction. The marketing and economic production of castings such as this demanded a knowledge of the properties of castings and more-exacting specifications to meet the needs of the future.

MR. PEERS remarked that to put certain requirements into a specification and then to make a "loophole" so that one could crawl out if necessary seemed to be nonsense to him. If there were no reason for them, they should not be there. He questioned whether or not the specification of low impurity-limits was needed in respect of 90 per cent. of British non-ferrous castings.

MR. MANTLE thought he had already answered that question in saying that the impurities he was worried about were aluminium and silicon in leaded gunmetal, of the order of 0.2 to 0.3 per cent. Too much gas absorption lowered the strength of castings. Possibly iron was also important, because it affected machinability and factors of that kind. So far as he could see, there must be some over-riding maximum level of impurities, one per cent. total or something like that. But, given limits in respect of important impurities, the rest did not seem to matter very much.

MR. PEERS replied that whilst Mr. Mantle made that statement, the revised specification stated the opposite.

MR. BLAKE said he was a little confused as to who drew up BS 1400 and other specifications. It seemed from the discussion that foundrymen were speaking as though BS 1400 was being revised in spite of what they wanted. Feeling strongly about it, could they not influence the BS 1400 committee so that the specification was revised as they considered necessary? If they did not, would there not be a tendency for somebody to supply castings which did not conform to the recognized standard, and the industry would lose orders for that reason?

MR. HUDSON replied that every foundryman in this country could participate in the preparation of British Standards, provided he supported his trade association. The BSI committee concerned was representative of the industry and of the users of castings, and after it had done its work the draft specification was circulated to as many founders and users of copper-base alloys as possible. It was impossible to legislate for the whole industry unless the industry was properly represented, and he contended it was not properly represented at the moment because of the insularity of a great number of brassfounders. Better co-operation would be the answer to Mr. Blake's main problem.

MR. A. R. FRENCH said that an important point about impurities was that they could effect the amount of scrap which foundrymen used. That affected the whole of the economy and also the delivery to customers. As to the need for another specification for founders who did not make castings for Admiralty or other onerous duties, he believed that point had been met in BS 1400 as revised, in that some of the gunmetals were covered by two specifications, one being the more onerous to cover higher-class work, and the other, a replica of the original specification.

Need for Fewer Basic Compositions

MR. W. D. MENDHAM said one had heard quite a lot about the work of the BNFMRA and he was rather concerned about trying to improve copper-base alloys and thereby to extend markets. The variations in the specification seemed still to be the old ones, such as LG3, which was supposed to be not very good, and there was no tendency to work in the new type developed by the BNFMRA. Certainly, he would not advocate increasing the number of alloys more than necessary, but it might be a good thing to introduce a new one which had been tested out to quite an extent, with a view later to dropping some of the others which were not so effective.

MR. HUDSON, who served on the BSI committee dealing with BS 1400, said the work in connection with the revision started two years' ago. Much of the work which had been done by the BNFMRA and by the Mond Nickel Company was done during those two years, and it was now being put forward for consideration in connection with the revised draft specification. It will have been observed that the old 86/7/5/2 gunmetal was omitted from the revised specification and a new one substituted, its composition being 87/7/4/2. Slight modifications to the new 87/7/4/2 specification would enable many of the improvements dealt with by Mr. Mantle and himself to become part of a standard specification. He, too, would like to see a number of the older compositions eliminated and the specifications made fewer and more suitable for the needs of the future.

MR. BUXTON asked if members of the Drafting Committee were aware of these new developments relative to improved gunmetals, because he considered it essential that notice should be taken of the research which had been done by the Mond Nickel Company and the BNFMRA. Would the industry benefit from that work by the revised specification.

bearing in mind that about 10 years would elapse before another draft specification was issued?

MR. HUDSON replied that he was quite sure the drafting committee were fully aware of the new developments and these would undoubtedly be taken into consideration before the specification was issued in its final form.

Realistic Casting Properties are Essential

MR. FRENCH said all would appreciate that, in order to have really useful mechanical tests, the properties of the castings must be sufficiently realistic to ensure that if the metal were not up to standard, it was rejected, and if it were up to standard, it would pass. It had been said by friends in the valve-manufacturing industry that they suffered from competition by the Americans when they offered their products on the Continent, because our mechanical-test requirements were lower than the Americans. That did not mean that our metal was not so good as the American; it might conceivably be better. He had been interested to see recently that the Americans had a new version of ASTM B.30, 1959 in which the properties had been increased. He asked if Mr. Hudson could say how the ASTM arrived at specifications and whether there was the same controversy in America as here when they did revise them.

MR. J. S. VANICK (an American visiting London) said that, in America, founders had depended considerably upon British research on copper-base alloys in guiding general improvement of properties and specifications. He personally had always thought that Britain made more bronzes than did America, because Britain had a fleet to maintain and a large naval-construction programme. In the USA, there had been a recession in the demand for these things and there were people who thought that there should be more realistic figures in the specifications than those which had been there for the last 10 or 20 years. Consequently, the ingot-producers' association had sponsored research at Battelle, and as a result, founders were expecting that better knowledge of melting practice, impurity limits, pouring temperatures, and controlled production, would lead to improved properties. The proposed improvement of mechanical properties was the result of four years' work. Work was continuing on higher-strength bronzes and they expected the foundries to find similar opportunity to upgrade existing specifications. The point was that if they could produce alloys with improved properties, they must let the trade know that such alloys were available before the latter decided that they had better turn to something else. That was perhaps part of the philosophy of the BNFMRA in doing the work which Mr. Mantle had outlined.

More Comment on Impurities

Regarding impurities, he recalled that Mr. Mantle had mentioned the need to keep the aluminium content at a low level, unless one could use, say, 4 per cent. and manage to prove that with the higher level of aluminium, one could get by with pretty good castings. That would be an individual performance and not one for the entire trade. One might use a melting practice whereby the aluminium-oxide could come out of the surface and did not produce areas of leakage. One of the valve companies in the US had experienced very serious cases of leakage caused by the presence of silicon in leaded-bronzes; so that somewhere a limit must be set.

Iron was not a difficult impurity to deal with, but it was important from the point of view of machining and pitting corrosion. If there were a high content of iron, as against the surrounding copper, there might be one or two other impurities present which might cause trouble in certain specific applications. High labour-rates in the US had provoked the idea that more welding and less mechanical jointing should be done. When moving into the welding field, one found that a low-melting-point copper-base alloy led to cracking. Certain impurities in the castings would accentuate cracking. There was considerable fear of "running too wild" with low-melting-point constituents, of which bismuth was one; and in some cases, lead was another. There seemed to be a move towards weldable copper-base alloys. Finally, Mr. Vanick said the industry in the US believed that the ASTM specifications were of advantage to the users.

GENERAL COMMENTS

MR. D. A. C. HUTCHISON (chairman at the meeting) said that all present would agree that they had learned a lot that evening. They would have said that the large 30-cwt. valve in the improved nickel-containing gunmetal looked very good against one with 3½ per cent. of voids. They would agree unanimously that 88/10/2 gunmetal was useful for making test-bars. The reference by Mr. Vanick to damaging impurities should lead to close examination of the problem of impurities. He hoped that buyers of copper-base-alloy castings were present to listen to what had been said at the meeting.

Vote of Thanks to Authors

MR. FRENCH proposed a vote of thanks to the authors of the papers for having made the meeting so interesting by their approach to their subject. He had been expecting that they intended only to deal with why specifications were prepared and what they were meant to do. Mr. Hudson had put forward a very good reason, based on the economy of the industry—and incidentally, Mr. Vanick's remarks had backed him extraordinarily well—for improving our standards. Mr. Mantle had approached the situation from a very different point of view. He had started to talk about specifications in general terms, and then had gone on to connect them in particular with what was being done by the BNFMRA. So one returned to how one could provide better specifications. Before the turn of the century, most of the copper-alloy metallurgical researches were concerned with manganese-bronzes (high-tensile brass) and it was well after the last war, about 1950, when it was felt that work on gunmetals had been rather a "hit and miss" affair, and that it was time they were looked at more

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closely. It was not surprising to hear Mr. Hudson talk about the use of nickel in gunmetal. The BNFMRA had investigated several basic compositions, but these did not include nickel as a constituent in their original work. However, one now understood from Mr. Hudson's remarks that they were going to cover a lot of ground again in order to do so. An important conclusion arising from the papers and discussion, which had impressed him, personally, was that there were three particular gunmetals—85/5/5/5, 86/7/5/2 and 87½/7½/2/3—which on paper did not appear to be very different. Yet it had been shown by the work which had been done that small differences could have a profound effect upon alloy characteristics.

Mr. Buxton, seconding the vote of thanks, said all attending the meeting were fortunate in having Mr. Hudson and Mr. Mantle to talk to them. One would hope that their views would be considered very fully by the BSI committee which was concerned with the revision of BS 1400. The members of the ABBF appreciated that it was necessary for them to supply something which the customers wanted, and that it was also necessary to go a step further and to supply something which, as Mr. Hudson had said, the customers ought to want, *i.e.*, something better. That was the line on which their technical associations had been working all the time. They had also to bear in mind the economies of the situation from the point of view of ingot production. Many ABBF members were using the products of the ingot manufacturers, and it would be a great shame to throw away all the non-ferrous formulations in this country just for the sake of providing everybody with a top-notch specification. There had got to be a lower grade as well, for it would very often be used. If UK founders could get their specifications on to the top limit to beat the Americans, and at the same time provide the ingot manufacturer and the foundryman (who was the customer and should "call the tune") with the material he could sell, then they were going a long way towards meeting their problem.

Film Review

"One Jump Ahead," 16-mm. sound/colour film prepared for Wolf Electric Tools, Limited, Hanger Lane, London, W.5. (Running time approx. 25 min.)

This film had its Press preview in London on January 12. Despite the fact that the name "Wolf" is never spoken in the dialogue, it is, frankly, an advertising film (and none the worse for that), with the twin objectives of indicating the application in industry of modern electric portable tools for heavy and continuous duty and for special-purpose work. The verbal propaganda is spoken by Mr. Raymond Baxter, of BBC fame, and the story is convincingly put across, in shots taken of tools being applied in various types of industrial undertakings. One of the most interesting for foundry personnel is the sequence filmed at the works of John Lang & Sons, Limited, the well-known lathe manufacturers (and founders) of Johnstone, in Scotland. Here, heavy drilling work is shown being carried out on large lathe-beds, using electric tools in conjunction with an electromagnetic "limpet" device for anchoring the drill to the casting. The other three firms whose electric-tool operations are filmed are: Modern Engineering (Bristol), Limited (steel roof-truss construction); Millars Machinery Company, Limited (making concrete-mixers), and Willenhall Radiator Company, Limited (motor-body work).

Although foundrymen and patternmakers, generally speaking, are already well conversant with the labour- and time-saving advantages to be derived from the use of small tools—grinders, cutting-off machines, drills, sanders, screwdrivers, etc.—they could probably extend their range of ideas by seeing the film. Copies are to be made available on loan, free of charge, to societies, educational bodies and trade organizations, on application to the address quoted earlier.

A NEW FILM, "Cast Metals and You," depicting the rôle of metal castings in every-day life, has been released by the education division of the American Foundrymen's Society. The film is available for showing to educational institutions and civic groups at no cost except transport charges, and to others at a rental fee of $10 (about £3 12s. 0d.) and shipping costs. Enquiries should be directed to the Society, at Golf and Wolf Roads, Des Plaines, Illinois, USA.

ISI Translations

The Iron and Steel Institute, 4, Grosvenor Gardens, London, S.W.1, announces that the following translations are now in course of preparation:—

1532 MELTING IN ELECTRIC FURNACES. Hajek, M. *Slévárenství* (Prague), 1958, (12), pp. 384-390.

1541 NON-OXIDIZING HEATING OF STEEL IN OPEN-FLAME FURNACES. Kuroedov, V. A. *Kuznechno-shtampovochnoe Proizv.*, 1959, Jan., pp. 25-31.

1547 DETERMINATION OF HYDROGEN IN FERROUS METALS. Gerke, F. K., & N. V. Zolotareva. *Zavods. Lab.*, 1934, (1), p. 19.

Translations recently made available by Mr. H. Brutcher, Technical Translations, P.O. Box 157, Altadena, California, USA, include:—

HB 4762 EFFECT OF LITHIUM ON FORM OF GRAPHITE IN CAST IRON. Tavadze, & D. D. Ebanoidze. *Lit. Proizv.*, 1959, Sept., p. 38. ($2.25.)

HB 4709 NON-UNIFORM DISTRIBUTION OF ELEMENTS IN WHITE CAST IRON. Lev, I. E. *Lit. Proizv.*, 1959, May, p. 36. ($2.00.)

HB 4711 TESTING MACHINE FOR BEARINGS AND SOME RESULTS OBTAINED ON DUCTILE-IRON BEARINGS WITH A PEARLITIC-FERRITIC STRUCTURE. Chisu, A., *et al. Met Constr. Masini*, 1957, Dec., pp. 30-34. ($4.75.)

Translation in preparation by Mr. Brutcher:—

HB 4771 HYDRODYNAMIC STATE OF METAL AND ITS EFFECT ON THE MACROSTRUCTURE OF CENTRIFUGAL CASTINGS. Reutov, N. N. *Lit. Proizv.*, 1959, June, pp. 22-27.

For the following bibliographies published by the Iron and Steel Institute there are special prices for members of the ISI, for public libraries and technical societies, and for booksellers.

No.
22 OXYGEN IN STEELMAKING (1946-1959), 37s. 6d.
21a CONTINUOUS CASTING OF STEEL (1956-1959), 25s.
21 CONTINUOUS CASTING OF STEEL (1934-1957), 25s.
17 PHYSICAL CHEMISTRY OF THE ELECTRIC-STEELMAKING PROCESS (1939-1949), 2s. 6d.
16 THE OCCURRENCE OF NITROGEN AND HYDROGEN IN LIQUID STEEL (1888-1949), 2s. 6d.
14a STEEL CONVERTER PRACTICE (INCLUDING MULTIPLEX PROCESSES), (1946-1950; and including some earlier references not mentioned in No. 14), 2s. 6d.
14 STEEL-CONVERTER PRACTICE (INCLUDING MULTIPLEX PROCESSES), (1925-1946), 2s. 6d.
12 EFFECT OF MASS IN THE HEATING AND COOLING OF STEEL (1904-1944), 2s. 6d.
11 QUENCHING MEDIA (1904-1944), 2s. 6d.
9 GRAIN-SIZE IN STEEL (INCLUDING ABNORMALITY, NORMALITY AND HARDENABILITY) WITH AN APPENDIX ON THE EFFECT OF GRAIN-SIZE OF THE MAGNETIC PROPERTIES OF STEEL (1922-1940), 2s. 6d.

Maintenance of Electric Motors

By J. L. Watts, A.M.I.E.E.

Electric motors are taken for granted nowadays in every phase of industrial activity. However, this in itself means that when they are engaged in arduous duties—as in many foundry applications—their maintenance is forgotten or at best inadequate. This article draws attention to the major items to be considered in regular maintenance routine for motors.

Electric motors, even when engaged in light duty, need a certain amount of attention in order to avoid risk of premature failure. A small quantity of grease may be added to ball and roller bearings about three times a year if lubricators are fitted, taking care to avoid introducing foreign matter with the grease. It is advisable to wash the old grease out of such bearings every three years or so, using warmed light mineral oil, afterwards repacking the bearings just over half full of new grease. Grease of high-melting temperature should be used in bearings which work in a hot position in foundries. Overheating of a ball or roller bearing is often due to excessive grease having been forced in, but may, of course, also result from a bearing being worn.

Sleeve Bearings

Sleeve bearings need an adequate supply of clean oil of the correct grade. Lack of lubricant may result in excessive wear or seizure of a bearing, and may result from leakage of a cracked oil-well, a loose drain-plug, oil gauge or overflow pipe, or a badly worn bearing, or oil may escape along the shaft due to an oil thrower being inadequate. Here periodic check should be made that oil rings are revolving freely—the rings may become obstructed due to foreign matter in the oil, the oil ring being out of truth or its joint having parted. Overheating of a sleeve bearing may be due to inadequate amount or incorrect choice of oil, a sticking oil-ring, bent shaft, scored shaft or bearing, choked oil-groove in bearing, overload, excessive belt-tension, or through a direct-coupled motor being out of alignment.

Bearings should be checked for wear periodically since very little wear may allow the rotor of the motor to rub on the stator. The amount of wear may be estimated by placing a finger in contact with the shaft and housing whilst the shaft is levered up in its bearing. It may be possible to measure the wear in a sleeve bearing directly by passing a feeler gauge between the shaft and bearing. In other cases, the radial-air-gap clearances may be measured by passing long feeler gauges between the rotor and stator cores at three or four points around the stator, one preferably being at the bottom and another in the direction of the drive. Comparison of the readings obtained at different times gives an indication of bearing wear, although variation of readings may also result from a foreign deposit in the air gap, a bent shaft, a bearing being loose in its housing, or a ball or roller bearing being loose on the shaft.

Remedial Measures

If the housing becomes worn it is often best to fit a new end-shield; alternatively, the housing may be bored out for the fitting of a suitable bush. A worn shaft may be built up by metal deposition, or by welding on new metal, and machining to size. Normally the inner race of a ball or roller bearing should be a press fit on the shaft, and the outer race a push fit in the housing.

Unused ball-bearing motors should be stored in a dry place free from vibration, otherwise the bearings can become damaged by stationary indentation—a source of short "life" in service. If a motor be allowed to overheat its life will be reduced, and column two of Table 1 shows the maximum permissible operating temperature of various classes of insulation. Where the class of insulation is not marked on the motor or stated in the relevant specification, it should be taken to be "Class A." The temperature of each motor in service should be checked periodically by touch; if the machine appears to be running hot, an alcohol thermometer should be used to measure the actual temperature on the external surface of the windings and iron cores of the windings. To secure a reasonable expectation of life, the measured temperature-rise should not exceed the values given in column three of Table 1. If the ambient air temperature exceeds 40 deg. C. the permissible temperature rise should be correspondingly reduced.

TABLE 1.—*Temperature Limits for Various Classes of Electric-motor Insulation.*

Class of insulation used in motor.	Maximum internal temperature (deg. C.).	Maximum permissible temperature-rise of windings or cores, measured by thermometer (deg. C.).
A	105	55
E	120	65
B	130	75
F	155	95
H	180	115

Causes of Overheating

Overheating may be due to foreign matter in the motor or on its ventilating screens, or to the motor being fitted in a confined space, a hot-air pocket, or a warm position. Motors should always be adequately ventilated and kept clean. Another common cause of overheating is overloading. The current in each line may be measured by a clip-on ammeter and compared with the rated current.

D

Maintenance of Electric Motors

In actual fact excess current in each line may be due to overload or low voltage. Unequal currents may indicate unequal line voltages or an electrical fault in the motor.

Motors having a sustained overload-capacity may be protected by overload releases set at, say, 25 per cent. overload. A lower setting is advised, however, for motors having a continuous maximum rating. Fuses in a three-phase motor-circuit should be the same size in each pole. Suitable sizes are given in Table 2—inattention to this detail (possibly caused by fuse-changing being carried out by inexperienced personnel) can lead to trouble. Brushes should be kept free-moving with adequate pressure, and renewed when worn, the surface of slip-rings and commutators being kept smooth. Particular attention should be paid to keeping insulating sleeves and bushes clean, as otherwise expensive loss of current can result.

TABLE 2.—*Suggested Sizes of Fuses for the Protection of 415-v. Three-phase Motor Circuits.*

Horsepower of motor.	Motor with direct-on-line starter.		Slip-ring motor; or motor with star-delta, auto-transformer or line-resistance starter.	
	Rating of cartridge fuse (amps.).	Number and size (s.w.g.) of tinned-copper fuse wire.	Rating of cartridge fuse (amps.).	Number and size (s.w.g.) of tinned-copper fuse wire
1	6	1/34	6	1/34
3	15	1/25	10	1/29
5	25	1/22	15	1/25
7½	30	1/21	15	1/25
10	50	1/18	25	1/22
15	60	1/17	30	1/21
20	80	1/15	50	1/18
30	100	1/14	60	1/17
40	160	2/15	90	1/15
50	200	2/14	100	1/14
60	200	2/14	125	1/17
75	250	2/13	160	2/15

Notes from the Branches

Southampton

The January 13 meeting of the Southampton section of the London branch of the Institute of British Foundrymen, held in Southampton Technical College, took the form of a liaison meeting with guest members attending from the London branch. Those travelling from London were welcomed by Mr. M. A. G. Batchelor, president of the section, during the formal opening of the meeting, as also were students from the College and members of other local technical societies. The attendance of 50 was considered good, bearing in mind the day's heavy snowfall in the area. The meeting took the form of a film show under the general title of "The Foundryman's Raw Materials." A number of aspects were shown, including: Preparation of iron ore; the blast-furnace and how it works; chemical reactions which take place in the furnace; production of pig-iron; tapping of a blast-furnace, and disposal and uses of slag. All the films shown had been prepared by the British Iron and Steel Federation. The commentaries were clear and the photography of both the actual plant and the animated diagrams excellent. After the showing of the films, Mr. J. Bain, president of the London branch, said how much the London members had enjoyed the evening and thanked Mr. Batchelor for his warm welcome.

Wales and Monmouth

The lecturer at the December meeting of the Wales and Monmouth branch, held at the Engineers' Institute, Cardiff, was Mr. John Hird, chairman of the IBF technical sub-committee, T.S. 46. The subject was the "Effect of Mould Materials on the Cooling Rate and Physical Properties of Cast Metals." The lecture was illustrated with a series of lantern slides and, whilst the sub-committee's investigations included non-ferrous metals, on this occasion Mr. Hird confined his remarks to the ferrous side of the industry. The subject was covered so comprehensively that questions were few and these were answered satisfactorily. It was a revelation to many that mould materials could exert so much influence upon the properties of castings.

Mr. H. J. V. Williams moved the vote of thanks to Mr. Hird, and Mr. Harold Davies, who seconded this, said he was astounded by some of the facts disclosed.

Apprentice Prize-givings

Birmid Industries, Limited

Presenting awards to apprentices of Birmid Industries, Limited, Dartmouth Road, Smethwick, Staffs, Mr. J. Wright, director of the Dunlop Rubber Company, Limited, said that since its apprentice training scheme was started in 1942, Birmid had recruited from its own ranks all the skilled men it needed for development, and he advised the apprentices to make the most of the educational facilities provided for them.

Mr. Wright presented the J. W. Berry trophy for the best apprentice of the year to Mr. David Mawson—in 1958, Mr. Mawson had been awarded the Hele-Shaw prize, which is presented by the Institution of Mechanical Engineers to the best trade apprentice in the country. The Percy Prichard memorial trophy for the most outstanding student apprentice was won by Mr. Ian Campbell. Seventeen apprentices received certificates marking the end of their training. Mr. E. Player, C.B.E., managing director of Birmid Industries, who presided, remarked that he was pleased to see so many mothers present at the ceremony.

Leyland Motors, Limited

Industrial education and its importance to Leyland Motors, Limited, in future years was high-lighted by speakers at the company's eleventh Apprentices' Annual Prize Distribution. Chairman at the ceremony was Sir Henry Spurrier, chairman and managing director of the company. The prizes were presented to over 50 appentices by Mr. C. B. Nixon, a director of the company. Announcing the result of examinations during the year, Mr. H. Glassbrook, apprentices superintendent, stated that 45 students had obtained the Ordinary National Certificate in Mechanical Engineering and that 24 of the 25 entrants for the Higher National Certificate course had obtained passes. In 1959 no fewer than eight Leyland Motors apprentices obtained Technical State Scholarships, seven of these being students at the company's day continuation school. Mr. Glassbrook also made special mention of an apprentice, Mr. John H. Owens, whose progress had been outstanding, who had been awarded the managing director's prize for outstanding results in the Higher National Certificate course. Mr. Owens has also been awarded prizes by Preston & District Engineers Employers' Association and by the Institution of Mechanical Engineers.

Bellfounders' Bicentenary

The firm of John Taylor & Company, bellfounders, of Loughborough, have recently celebrated the bicentenary of the birth of Robert Taylor, the founder of this famous family of bellfounders. The family were not always carrying on their trade in Loughborough—the foundry was established there in 1839. Before that, the family cast bells in St. Neots, Hertford, and at Oxford where the Taylors stayed until their removal to Loughborough. All this is set out in a brochure prepared in connection with the firm's bicentenary dinner held on January 1, in the Bull's Head Hotel, Shelthorpe. A second booklet dealing with the actual history of the Loughborough bell foundry, commences with a few notes on bellfounders in 1366 when the fixed foundry replaced the itinerant artisans. The achievements of this firm are indeed impressive and include the casting of the "Great Paul," "Great Peter" (York), and "Great George" (Liverpool) bells, together with a number of carillons widespread throughout the world.

Great Bell of Moscow

Apropos of the above-mentioned bicentenary, it was an interesting coincidence that brought to the Editor's attention an illustration of the Great Bell of Moscow. A reproduction of the picture is given below. This highly-decorated bell, which weighs 200 tons, is the largest ever to be cast; it was never hung, since it is reported to be cracked.

Allied Ironfounders' Prize Distribution

Allied Ironfounders, Limited, invited the prize-winners in the competition they organized in connection with the Rayburn window-display competition, to a luncheon party held at the Kensington Palace Hotel, London. Mr. H. Wilson Bennetts, joint managing director, presided, and in his postprandial address said the reason for the competition was an endeavour to raise the standard of window display among builders' merchants. Clearly the guests represented companies which took the matter seriously and what had been done and was still being done by them was of immense value to the trade as a whole, since they were setting a higher standard for the future, a standard which other people who were not so display conscious must follow. Sometimes, he said, he wondered whether builders' merchants realized the magnitude of the distributive business of which they formed part. The building trade was probably the most consistently successful industry in the country.

What of the future for solid-fuel-burning appliances, he asked. It might be felt to-day, he said, that other fuels, electricity, gas and oil, were more attractive, but he took the view that solid fuel applied to heating and cooking had even greater prospects in the future than it had had in the past. His company sold about £4,500,000 worth of appliances each year, and was only one of many manufacturers. But selling ability played a necessary part, and people had got to be persuaded that appliances could do a good job and do it efficiently. The one vital point solid-fuel had in its favour was that it was considerably cheaper than any other fuel at present available, he stated.

Foundry Equipment, Limited, at AFS Exhibition

Foundry Equipment, Limited, through their associated company, F. E. (North America), Limited, have again taken space at the American Foundrymen's Society foundry exhibition, which is to be held from May 9 to 13 in Philadelphia. The company will be occupying a stand of nearly 2,000 sq. ft. in the main hall. Emphasis is to be placed on sand conditioning, and two types of the Con-Belt sand mills are being despatched from the works in Leighton Buzzard. New models of moulding machines, as well as Sandrammers and a shell coreblower will be included in the exhibit. The stand will be manned almost entirely by the staff of the Toronto company, but one of the directors and possibly the chief service engineer from England will also be in attendance.

"Masson Bell" Gift

George Fletcher & Company, Limited, engineers, of Litchurch Lane, Derby, have presented the "Masson Bell" to St. Barnabas's Church, Derby. The bell, which is of cast steel and weighs 2¼ cwt. has a strong clear tone. At one time it was used to summon the workpeople to the Masson works, in Litchurch Lane. The gift of the bell to the church was arranged through Mr. W. G. Price, director and works manager of the firm, and Mr. Wilfred Smith, who was a draughtsman at the firm for 50 years. Mr. Smith is honorary secretary of the Parochial Church Council.

FLETCHER, HOUSTON & COMPANY, LIMITED—Mr. Charles Stephens has resigned from the board. In April of last year he resigned the secretaryship to take up another appointment.

American Letter

Shell-mould Deformation

A recent survey of hot deformation of shell moulds emphasized that defects such as mould cracking and surface defects could often be attributed to mould-wall movement and thermal shock. During this work, carried out by an AFS committee, instrumentation and test methods were developed to evaluate the deformation changes which occur near the surface of conventionally-formed mould walls which are exposed to molten metal. In addition, at least five different manufacturing organizations submitted hot-deformation data obtained from tests on three resin-coated sands. These coated sands were prepared at one source, and then properly sampled and distributed for individual evaluation. The results were fundamentally alike, and established certain characteristics of shell deformation due to high-temperature heat applied to one side of a pre-cured shell specimen. These specimens were 1 in. wide and ¼ in. thick, with the distances between supports varying between 3 to 3.375 in., and loads of from 258 to 681 gm.

Test Principles

The principle of the tests carried out is shown in Fig. 1. In actual fact three test rigs were developed, designated A, B, and C. The arching of the sample toward the heated side, disregarding the opposing load stress, is generally explained as an expansion of the sand grains as they are heated. The size of grains, their configuration, degree of packing, heat conductivity and thermal expansion are expected to vary the degree of movement for any specified condition of test. As the specimen reaches a uniform temperature the resin binder is weakened, causing the specimen to sag. The variations in deformation shown in Fig. 2 are quite adequate to analyze differences in shell performance.

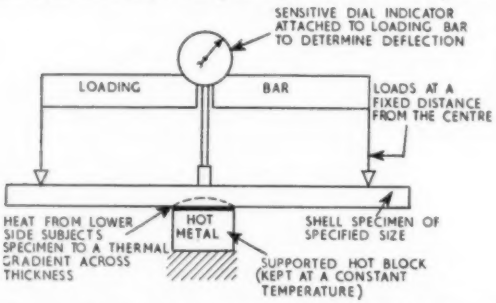
SENSITIVE DIAL INDICATOR ATTACHED TO LOADING BAR TO DETERMINE DEFLECTION
LOADING BAR
LOADS AT A FIXED DISTANCE FROM THE CENTRE
HEAT FROM LOWER SIDE SUBJECTS SPECIMEN TO A THERMAL GRADIENT ACROSS THICKNESS
HOT METAL
SHELL SPECIMEN OF SPECIFIED SIZE
SUPPORTED HOT BLOCK (KEPT AT A CONSTANT TEMPERATURE)

FIG. 1.—*Principle of operation of one of the set-ups (instrument C) for testing hot shell-deformation evaluation. Data are charted as dimensional deflections with time of heat application. Variables of the test are:* (1) *weight of load applied;* (2) *area of block adjacent to specimen;* (3) *temperature of block when applied to specimen;* (4) *dimensional deflections with time of heat application;* (5) *rate of heat conductivity (a time-temperature relationship);* (6) *thickness and width of shell-mould specimen, and* (7) *distance between supports.*

In this graph, A-3 is low in hot rigidity and will probably not retain its shape, especially when under-cured. B-6 and C-6 are both considered adequate for medium-sized bronze castings. C-6 may be approaching a strength rigidity under conditions of heat which cause cracking in the mould and hot tears in the castings.

These test results, together with data on tensile strength, transverse strength, free expansion and bulk density of moulding composition (bearing in mind that this is a round-grain sand which is more easily close-packed), can be analyzed in relation to actual shell performance. Defects such as mould-cracking and hot-tears are then more easily avoided. The thickness of the shell, and the manner of supporting the shell during casting, will further determine the relative importance of initial refractory-grain expansion, and subsequent hot-sag deformation.

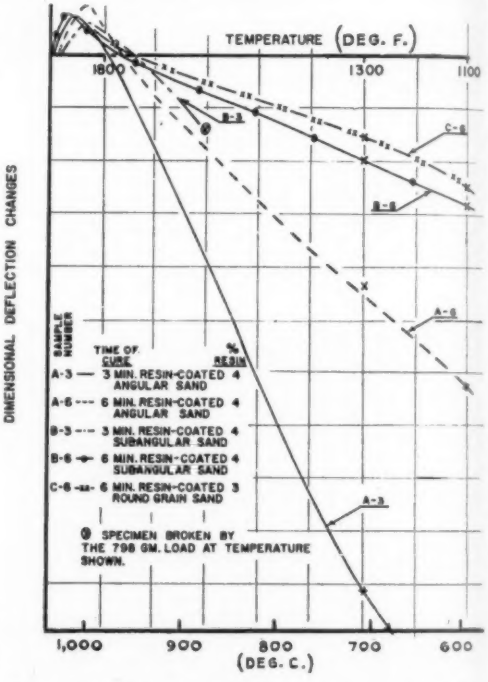

FIG. 2.—*Graph showing typical variations of deformation due to differences in shell specimens. Data for this graph were obtained with instrument A, in which the hot mass was placed above the stress specimen, whereas in instrument C (see Fig.* 1) *the load system was inverted.*

The results are meant to constitute a guide to the selection of moulding materials, moulding methods and casting design to develop optimum castings. It is hoped that further refinements of technique will be discovered by the committee as investigations proceed.

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* Abstracted from a report by sand committee 8N of the American Foundrymen's Society, prepared by Roderick J. Cowles, senior research engineer, Walworth Company, Braintree, Massachusetts.

CRAVEN BROTHERS (MANCHESTER), LIMITED, announce that the address of their London office is now 139, Park Lane, London, W.1 ('phone: MAYfair 6783).

Equipment and Supplies

Super-sulphated Cement

Lafarge Aluminous Cement Company, Limited, of 73, Brook Street, London, W.1, have been appointed main distributors of the first British-made super-sulphated cement. This cement is made by Frodingham Cement Company, of Brigg Road, Scunthorpe, from a granulated slag of unusually consistent composition, arising in the works of Appleby-Frodingham Steel Company (a branch of United Steel Companies, Limited), and it is claimed that this slag gives a cement of extremely dependable quality and performance. The new cement hardens at approximately the same rate as Portland cement, and is claimed to have a very high resistance to sulphates, sea-water, oils, fats and dilute acids. Its very low heat of hydration makes it particularly suitable for mass concrete work, even under hot or tropical conditions.

Suspended-bowl Vibratory Screens

The suspended-bowl type of vibratory screen manufactured by Sinex Engineering Company, Limited, of North Feltham Trading Estate, Feltham, Middlesex, has now been redesigned to enable users to fit new wire or nylon-mesh screens themselves without having to obtain replacements from the maker. The previous design made use of a screen mounted on a beechwood ring, supplied as a complete assembly; in the latest model, however, the wire mesh is simply folded upwards round the edge of the bowl and held in position by a circular clamp. This development will make screen replacement a cheaper procedure, and will eliminate the need for stocking a range of screen assemblies.

Electric Motors

A new range of totally-enclosed fan-cooled electric motors, claimed to be smaller, lighter and cheaper than existing motors of the same type, is announced by English Electric Company, Limited, Marconi House, Strand, London, W.C.2. The dimensions of the new motor are exactly the same as the "C" type ventilated motor (British Standard 2960), and the two types are therefore interchangeable. The new units are claimed to have outputs up to 100 per cent. greater than existing motors of the same size, and are designed for industrial application, particularly where there is dust and dirt in the atmosphere. Special versions, having internal and external anti-corrosion treatment, are to be produced for the chemical and gas industries. Special features of the motors are: an all cast-iron exterior with finger-proof cowls; a plastic (polyester) non-corrosive external fan; a terminal box of weatherproof construction with four screw-fixing bolts; drain-holes with easily detachable plastic plugs; provision for an earthing terminal, and a rating plate with full motor details (including bearing sizes and grade of grease).

Safety Periscope

A safety periscope has been added to the range of remote and indirect-viewing equipment made by P. W. Allen & Company, 253, Liverpool Road, London, N.1. This periscope (type A.201) is for use when closely viewing processes through sight glasses in certain types of furnaces. Using the A.201, the observer can stand well clear of the window in a safe zone and yet have his "eye" right up to the sight glass. The unit consists of a periscope optical system of unit power with a field of view of 35 deg., fully corrected and free from distortion. The optics are contained in a 30-in. long, 1¼-in. dia. metal tube, fitted at one end with a rubber eye-shield and focusing sleeve, and at the other a 90-deg. prism. Objects more than 3 in. from this prism can be viewed with great depth of focus at any setting. Low-voltage high-intensity spot-lights are also available, which fit on the end of the periscope.

Controller for Low Temperatures: West Instrument, Limited, of Brighton, have recently started manufacturing a resistance temperature-controller and indicator of entirely new design, which takes them into the field of low-temperature control. The new instrument, which is available with stepless, proportioning and on/off control, is suitable for a wide span of operating temperatures, and offers precision control and indication to below minus 100 deg. C.

Furnace-observation Glasses: Safety Products, Limited, Holmethorpe Avenue, Redhill, Surrey, announce that they are now able to supply furnace-observation spectacles fitted with colour-corrected blue lenses—these lenses conform to a German Standards Institute specification.

Locker-room Equipment

The illustration alongside shows an unusual combination of clothes-lockers, hat- and shoe-racks and hanger accommodation which has been evolved by Oostwoud Fabrieken of Utrecht, Holland. The coat-hangers are of a special design which, *inter alia*, discourages pilfering. They can only be hung evenly spaced on the overhead rails. Another advantage claimed for the system—which is known as "Multilok"—is that it permits almost full vision over the whole locker-room.

Company News

Aveling Barford's increased Business

A welcome increase in the number of orders placed, both home and overseas, in the last quarter of the year to September 30, 1959, and the first quarter of the current year, is reported by Mr. Edward Barford, chairman of Aveling-Barford, Limited, power-driven plant manufacturers, of Newcastle-upon-Tyne. Reorganization of group production was largely completed in 1958-59 and the trade investment in British Standard Machinery of Australia, Limited, has been sold and a new wholly-owned subsidiary formed to be responsible for manufacturing arrangements there.

Though group turnover in 1958-59 was higher, trading profit declined to £487,970 (£541,999). Mainly due to tax rate reduction the profit balance available rose to £243,247 (£216,237) and the dividend is held at 12½ per cent. Year-end group fixed assets expanded to £1,251,814 (£1,179,538) with outstanding commitments of £66,000.

G. & R. THOMAS, LIMITED, refined pig-iron manufacturers, etc., of Bloxwich (Staffs)—The Staveley Coal & Iron Company, Limited, has acquired all the company's capital.

GARRARD ENGINEERING & MANUFACTURING COMPANY, LIMITED—So far as the board is aware, there is no foundation for the rumours suggesting that there will be a take-over bid for the company's share capital.

ROTARY HOES, LIMITED—Allotment of the 13,746 shares left from the company's recent ordinary issue, to applicants for 828,963 excess shares, has been by ballot. Successful applicants have been allotted either 20 shares or, where application was for less than 20, full allotment.

RICHARD LLOYD, LIMITED, machine-tool makers, engineers, etc., of Birmingham—Over 92 per cent. of holders have accepted the offer by the British Rollmakers Corporation, Limited, for the issued preference capital. The offer is now unconditional. Late acceptances will be included in the terms of the offer provided they are not received later than January 31.

LEY'S FOUNDRIES & ENGINEERING, LIMITED—Dividend is being raised by the equivalent of 2 per cent. to 7½ per cent. with a 4 per cent. final for the year ended September 30, 1959. During the year there was a one-for-one scrip issue, before which a first interim of 3 per cent. was paid on £550,000. The second interim of 2 per cent. and final now announced are on £1,100,000. Net profits for 1958-59 are £384,383 (£303,502).

PULSOMETER ENGINEERING COMPANY, LIMITED—Legal proceedings referred to in the 1958 directors' report as then pending against the company in connection with negotiations for the acquisition of the share capital of J. Caslake, Limited, manufacturers of art metal work, of Bournemouth, have been disposed of by agreement between the parties. The company has paid the sum of £27,500 and has no further obligation in the matter.

ACROW (ENGINEERS), LIMITED—The company's order-book is very large and all works are operating at full overtime capacity, state the directors. First quarterly dividend is being raised to 12½ (8¾) per cent. on capital increased by a one-for-seven scrip issue, for the year to March 31, 1960. Actual payments for the previous year on the smaller capital comprised three 10 per cent. quarterly dividends and a final of 12½ per cent., the total being 42½ per cent., equivalent to 37$\frac{3}{16}$ per cent. on the present capital.

Proposed Merger of Reyrolle and Parsons

A joint statement issued by A. Reyrolle & Company, Limited, electrical engineers and switchgear manufacturers, of Hebburn (Co. Durham), and C. A. Parsons & Company, Limited, engineers and makers of turbines and turbo-electric generators, etc., of Newcastle-upon-Tyne, reveals that a merger of the two companies is planned. Some form of integration is felt to be in the best interests of stockholders.

Although Reyrolle holds 40 per cent. of the Parsons' equity, there are technical legal difficulties in a closer association and counsel's opinion is being sought. A merger would create a group with total assets of some £55,000,000 and net current assets of around £27,000,000.

Under the scheme proposed a holding company would be set up to take over the share capitals of both companies, but they would continue to trade as separate entities with their own managements and present works. It is stated that the proposed integration would strengthen the existing commercial and technical collaboration and take advantage to the fullest extent of the diversity of products of the two companies, providing at the same time the benefits and economies of a unified organization.

Both companies are interested in atomic energy and are members of the Nuclear Power Group, Limited, the consortium which is building nuclear power stations at Bradwell (Essex), Berkeley (Glos), and Latina (Italy).

EMI makes counterbid for Lancashire Dynamo Holdings

The latest offer for Lancashire Dynamo Holdings, Limited, has been made by Electric & Musical Industries, Limited. The EMI counterbid for the ordinary and preference capital of Lancashire Dynamo is £11,600,000, and its acceptance is recommended by the Lancashire Dynamo directors, who are to issue a circular to stockholders shortly.

The previous bid came from Metal Industries, Limited, on Christmas Eve and was made without prior consultation with the Lancashire Dynamo board. It was worth some 65s. 9d. per ordinary unit.

The terms of the EMI bid are 150 EMI ordinary shares for every £100 stock in Lancashire Dynamo, and 42 EMI ordinary for every £100 of Lancashire Dynamo preference stock.

A statement from Metal Industries last Thursday said that an amalgamation between MI and Lancashire Dynamo would bring "considerable benefits" to shareholders of both companies. It recommended Lancashire Dynamo shareholders to take no action on the EMI bid and promised a further statement soon.

ECSC Steel Output, 1959

The output of steel ingots and castings in the European Coal and Steel Community in 1959 reached the record total of 63,142,000 *tonnes*. This was 8.9 per cent. more than the 57,997,000 *tonnes* produced in 1958, and 5.5 per cent. more than the previous record total of 59,804,000 *tonnes* produced in 1957.

The output of pig-iron and ferro-alloys in 1959 was also a record, reaching 46,669,000 *tonnes* or 7.2 per cent. more than the 43,516,000 *tonnes* made in 1958.

Ionizing Radiations Regulations

Revisions to the draft code—issued in July, 1957—for the protection of workers engaged in operations involving the production, emission or use of sealed sources of ionizing radiations are contained in the Second Preliminary Draft of the Factories (Ionizing Radiations) Special Regulations* recently published by the Ministry of Labour. Comments are required by April 15.

In this new draft, the schedule, specifying the maximum permissible radiation doses, has been remodelled taking account of the views of the Medical Research Council and the revised recommendations of the International Commission on Radiological Protection. It has been simplified by restricting it to certain ionizing radiations which are ordinarily met with in industrial work with sealed sources. In the Regulations it is also proposed that a number of definitions be revised. One of these brings within the scope of the Regulations certain machines which are not intended to produce ionizing radiations but which in fact do so. Another makes it clear that a sealed source consists of the radioactive substance and the bonding or container which seals it.

New provisions deal with tests for personal exposure and medical supervision, with the examination of persons employed in the processes, and the procedure to be adopted where workers exployed in the processes move from one factory to another. Fuel elements used, or intended to be used, in a nuclear reactor will not be covered by these Regulations which also exclude from their application ionizing radiations used for medical purposes in factories.

*Obtainable from H.M. Stationery Office; price 1s. 3d. net.

European Foundry Apprentice Competition

In last week's JOURNAL, the paragraph concerning arrangements for the European Foundry Apprentice Competition was incorrect in one particular. The venue at which the competitors will face their written essay and calculations test on Monday, May 23, was given as the Birmingham College of Advanced Technology, whereas in actual fact these sections of the Competition will be taken at the National Foundry College in Wolverhampton. It is Thursday's drawing test which will be staged in the Birmingham College.

It is expected that the competitors will be accommodated at Tor Lodge, the hostel for students of the National Foundry College, while they are in the Midlands. The Competition is, of course, spread over the whole week beginning on May 22, and is the first occasion on which the event has been staged in the United Kingdom—the two previous competitions being held in Germany in 1957 and France, in 1958. The choice of F. H. Lloyd & Company, Limited, as hosts for the practical side of the contest makes it the first occasion that any part of the proceedings have taken place inside an actual foundry. No doubt this represents an attempt to put the competitors at their ease, eliminate stage-fright and provide the right amosphere for the display of real foundry skill.

THE ENGLISH ELECTRIC COMPANY, LIMITED, of St. Catherine's, Ontario, Canada, have recently taken delivery of two "Reverbale Junior" furnaces, supplied through Drew Brown, Limited, Canadian agents for the makers, Sklenar Furnaces Limited, of 385, Newport Road, Cardiff.

Britain's Largest Electric-arc Furnaces?

Following the recent statement by United Steel Companies, Limited, that they are to spend £10,000,000 on the installation of what is expected to be the largest electric steelmaking plant in the world at their Steel, Peech and Tozer branch, G.W.B. Furnaces, Limited, of Dudley, Worcestershire, announce that they are to supply the first two electric-arc furnaces for the project. These furnaces will be almost twice as large as any previously built in Great Britain, each one having an electrical rating of 40,000 kva. The first is expected to commence operation in 1963.

Apart from the regulator, the furnace units will be entirely of British manufacture. Each furnace shell will be 24-ft. internal dia., with a nominal capacity of 150 tons, and will be capable of melting at the rate of 1 ton per min. In practice the furnaces will be used for a maximum of 110 tons ingot weight. Construction of the furnaces will follow the Demag gantry design, in which the roof is the only item lifted from the shell when top-charging takes place. The weight of the electrode equipment is permanently carried by the gantry which, after raising the roof, swings aside for furnace charging around a king post. The drive for tilting will be by means of d.c. motors through a gear train to pendant pin racks attached to the underside of the furnace.

To facilitate the initial melt, shell rotation is incorporated and will allow the drilling of the scrap in three positions of each electrode. Rotation is 40 deg. either side the normal electrode position. This device is advisable when the scrap used is very light and the first downward movement of the electrodes provides an insufficient pool of molten metal for protecting the lining. Alternatively, when heavy single items of scrap are included in the charge, such as ladle skulls, or when other non-metallic inclusions or slag-covered areas give poor electrical conductivity, it is convenient to rotate the shell and re-strike the arcs in a fresh position.

Expansion visualized for Wm. Beardmore & Company, Limited

Proposals for expanding capacity, both at the Sheffield steelworks of Thos. Firth & John Brown, Limited, and at the Glasgow works of its subsidiary, William Beardmore & Company, Limited, are under consideration, states Sir John Green, chairman of both the parent and subsidiary companies. The proposals include the possibility of putting down new mills, but no firm decision has been made, he said. "We are ploughing back a huge amount of money and it is taking the form particularly at Beardmore's of trying to adapt a huge works to the changing pattern of demand."

Sir John said that armour plating was no longer required and there had been a severe contraction in the demand for heavy forgings. "But," he added, "we have put down a very big modern electric plant at Beardmore's—one of the largest in the world—and we have to find an outlet for its production. We are also examining the possibility of putting down a cogging mill at Beardmore's and we have introduced at the Parkhead Works a branch of business not hitherto carried out there."

THE Duke of Edinburgh will visit the headquarters and laboratories of the Tin Research Institute at Greenford (Middx) on March 16.

Personal

Mr. J. D. LAKE, general sales manager of A.E.I.-Hotpoint, Limited, has been appointed sales director.

Mr. SYDNEY G. HEARN is retiring as assistant general manager of the Eastern Region of British Railways on March 31.

Sir GORDON RUSSELL has been appointed a member of the Council of Industrial Design following his retirement as director.

Mr. A. CUSINS has been appointed manager of the London office of Belliss & Morcom, Limited, with effect from February 1.

Sir ARTHUR ELTON has been appointed controller of the central information department of Associated Electrical Industries, Limited, from March 1.

Mr. L. W. NOBLE, formerly manager at the North Shields works of Cockburns, Limited, valve makers, has been appointed manager of the London office.

Mr. JOHN L. LUTYENS has been appointed group director of research for the Pressed Steel Company, Limited. He has also joined the company's motor-car-body divisional board.

Mr. GUY ALFRED RIDER, F.C.W.A., chairman of Dartmouth Auto Castings, Limited, and a director of Coneygre Foundry, Limited, Tipton, Staffs, has been appointed deputy managing director of Birmid Industries, Limited, Smethwick, Staffs.

After 49 years with the company, Mr. JOHN WRIGHT, chauffeur at Leyland Motors, Limited, Lancs, has now retired. He has driven heads of government and business men from many parts of the world as well as group directors and executives.

Dr. CYRIL WEBBER has resigned as technical assistant to the managing director of the Shell Chemical Company, Limited, with effect from February 1, to take up directorships with Yarsley Research Laboratories and Yarsley Testing Laboratories.

Mr. JAMES A. FOLGER, president and a director of J. A. Folger & Company, San Francisco, USA, has been elected to the board of the Caterpillar Tractor Company, Limited. Mr. Folger fills the vacancy created by the death of Mr. E. C. LIPMAN.

On his recent retirement, after 48 years' service with the firm of Drakes, Limited, constructional gas engineers, Ovenden, Halifax, the 65-year-old company secretary, Mr. W. CYRIL SHOESMITH, received presentations from the directors and staff. Mr. Shoesmith is also a director of three subsidiary firms.

Mr. W. B WRAGGE has been appointed managing director of the Exors. of James Mills, Limited, steel rollers and manufacturers of bright steel bars, etc., of Woodley, near Stockport, and Bredbury Mills, Limited, both subsidiaries of the Guest Keen & Nettlefolds, Limited, group.

The Prime Minister, the Right Hon. HAROLD MACMILLAN, M.P., has accepted an invitation to be the principal guest and speaker at the annual dinner of the Institute of Metals, which is to be held in the Great Room, Grosvenor House, London, W.1, on March 31. The United States Ambassador has accepted to reply to the toast of "The Guests."

Mr. D. F. CAMPBELL, formerly chairman, has been appointed president of the Metallurgical Equipment Export Company, Limited. The chairmanship will be held in rotation by the managing directors of the companies constituting the consortium. Mr. R. B. POTTER has been appointed chairman for the next two years, and Mr. P. WRIGHTSON, deputy chairman, for the same period.

Consequent upon his appointment to the executive board of the Incandescent Heat Company, Limited, Mr. P. M. WILLIAMS has relinquished his post as manager of the foundry plant division of the company. His place is taken by Mr. J. S. PERKS, previously assistant manager. Mr. Perks, who has been with the division for the past five years, will be assisted by Mr. M. JURKOWSKI.

Mr. W. L. SIMS, assistant managing director of Wadkin, Limited, the Leicester machine-tool firm, has been elected chairman of the UK committee which advises on the approvals scheme for electrical exports to Canada. The scheme is operated by the British Standards Institution on behalf of the Canadian Standards Association. He succeeds Mr. D. MAXWELL BUIST, who has been chairman of the committee since its inception nearly 10 years ago.

After 27 years' service with Taskers of Andover (1932), Limited, Mr. CECIL A. LAWRENCE, general sales manager, has retired from the firm for health reasons. Mr. Lawrence, who is 60, served his engineering apprenticeship with the firm of Stothert & Pitt, Limited, and then went to Canada where he was employed by the Dominion Bridge Company. At a farewell dinner, Mr. Lawrence was presented with a miniature camera and a gold-mounted pen and pencil set.

At a party held in the Cutlers' Hall, Sheffield, Mr. ARTHUR MARSHALL, managing director of Thomas Marshall & Company (Loxley), Limited, refractory manufacturers, received from Mr. Thomas Marshall, chairman of the company, a gold watch in appreciation of his 40 years' service. Another recipient was Mr. C. W. MARSDEN, also a director of the company. The firm introduced long-service awards in 1942, since when eight have been made for 40 years, and 63 for 25 years' service.

UNITED DOMINIONS TRUST, LIMITED, announce that Mr. L. D. WARR has been appointed a manager (new business) of United Dominions Trust (Commercial), Limited. He took up his new duties at UDT's head office on January 1, and will be primarily concerned with finance for industrial plant and equipment. Mr. Warr has been in Leeds as the Trust's regional manager for the North-East since November 1952. He will be succeeded by Mr. G. H. PHILLIPS, whose place as branch manager in Birmingham is being taken by Mr. J. H. GOLDSMITH, from the Worcester office.

BRIGADIER ARTHUR LEVESLEY, a director of Edgar Allen & Company, Limited, Sheffield, presented an oak-panelled barometer to 69-year-old Mr. WILLIAM EVANS, salvage officer, who retired in December after 56 years' service with firm. Mr. H. H. NIXON, a foreman moulder, who has also retired, received a cheque. Other long-serving employees of the firm who retired at the end of last year were Mr. B. CLARKE, moulding-shop foreman; Mr. J. GUNSTONE, foundry assessor; Mr. W. SPENCER, foreman blacksmith; and Mr. W. MATTHEWS, plating department foreman. Mr. S. HAIGH, machine-shop foreman, retires this month.

Mr. H. F. HODGSON has been appointed chairman and managing director of Joseph Sankey & Sons, Limited, following the resignation as chairman of Mr. K. S. PEACOCK, who remains on the board. Mr. Peacock is the chairman of the parent company, Guest, Keen & Nettlefolds, Limited. Mr. R. P. BROOKES, a

director of G.K.N., has been appointed to the board of Joseph Sankey, Sons, Limited, and Mr. J. R. MARTIN, a director of the latter company, has been appointed general manager of Hadley Castle Works in the place of Mr. G. B. SANKEY, who has been appointed assistant managing director of the company. Mr. F. W. J. Hibbard and Mr. W. W. WATT have been appointed directors.

Mr. T. R. MIDDLETON has been appointed a director of the English Steel Corporation, Limited, and a director of research with effect from February 1. Dr. H. H. BURTON retires from the board of the company on January 31, but he will continue as research consultant to the group until December 31. Dr. H. H. Burton joined the staff of the research department of Cammell Laird & Company, Limited, in 1907 and later became assistant superintendent of that department. After the formation of English Steel Corporation, Limited, in 1929, Dr. Burton was appointed senior assistant to the late Mr. J. H. S. Dickenson, whom he succeeded as chief metallurgist of the company in 1934, and was appointed a special director in 1938. He is a vice-president of the Iron and Steel Institute, an associate member of the Ordnance Board and a member of the general board of the National Physical Laboratory.

Obituary

Mr. CHARLES EDMESTON, chairman of Archibald Edmeston & Sons, Limited, engineers, Patricroft (Lancs), has died at the age of 76.

Mr. HENRY R. BRAIN, who retired in October last after being for 21 years foundry manager of Sibley's (1922) Limited, non-ferrous founders of Battersea, London, has died aged 71.

The death is announced of Mr. PETER WOOD MURRAY, a divisional director of K. S. Paul (Molybdenum Disulphide), Limited, London, N.W.10, following injuries received in a car accident.

The death occurred on January 3 of Mr. HARRY W. HOWARTH in Morecambe, where he was living in retirement. Mr. Howarth was one of the founders, and the first managing director, of the Pennine Chainbelt Company, Limited, now at Armley, Leeds. He was 75.

The death has taken place of Mr. JAMES S. SMITH, works manager of John Marshall & Company (Motherwell), Limited, boilermakers, of Motherwell. He started work with the firm on leaving school and served in various departments until his appointment as works manager some nine years ago.

Mr. JOHN FINDLAY, who has died at the age of 70, was managing director of Barnes & Bell, Limited, Glasgow, with whom he had been associated for about 50 years. A few weeks ago he was elected chairman of the Steel Stockholders' Association. He was a past-president of the Iron & Steel Trade Benevolent Association, and chairman of the Premier Lamp & Engineering Company, Limited, Leeds.

"Waste Heat" in Foundries

In the correspondence under this heading on page 36 of last week's JOURNAL, the value quoted by Mr. White (BCIRA development engineer) was unfortunately given as the ridiculously low figure of 30 BTU's instead of his figure of 30 therms, the essential conversion having been omitted. Thirty therms is equivalent to 3,000,000 BTU, of course.

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FOUNDRY PLANT BY **Richards**

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Phoenix Iron Works, Leicester Telephone 61237

News in Brief

THIRTY-FIVE APPRENTICES from Newton Chambers & Company, Limited, Sheffield, who visited London on January 9, were taken on a conducted tour of the House of Commons and other places of interest.

THE IRON AND STEEL BOARD report that the production in 1959 of steel ingots and castings was 20,186,000 tons. In 1958, a 53-week year, it was 19,566,000 tons. The pig-iron output in 1959, was 12,582,000 tons as against 12,975,000 in 1958.

UNITED STEEL COMPANIES, LIMITED, have moved from their headquarters in Westbourne Road, Sheffield, to The Mount, Sheffield, the former home of James Montgomery, the Sheffield poet. A farewell party was held at Westbourne Road on January 15.

AN IMMEDIATE start is to be made by Ferranti, Limited, electrical and general engineers, on the building of a new research, manufacturing, and development unit next to its Crewe Toll, Edinburgh, premises. Cost of the new building will be in the region of £120,000.

ABOUT 200 PENSIONERS in Wolverhampton have applied for jobs offered by the Villiers Engineering Company, Limited, which is suffering from a labour shortage. In order to obviate deductions from old-age pensions, the company is offering a special 25-hour five-day week.

AFTER SUSPENDING work in 1958, Stewarts and Lloyds, Limited, is to continue the construction of its £150,000 three-storey students' building near its Corby works. The building will provide living and study accommodation for about 60 students and there will be a resident warden and other staff.

FOR THE FIRST TIME in the history of the National Industrial Fuel Efficiency Service the closing stages of 1959 brought bookings of paid services above £20,000 in a month. The value of regular service agreements is nearing the £80,000-a-year mark. More than 760 firms and organizations now employ NIFES on regular service work.

FOLLOWING A SURVEY of the potential market for the manufacture of cast-iron pipes in Australia, Stanton Pipes of Australia Pty. has been registered in Melbourne with a nominal capital of £A5,000,000. The parent company in the UK, the Stanton Ironworks Company, Limited, near Nottingham, is a subsidiary of Stewarts and Lloyds, Limited.

THE BRITISH NATIONAL CONFERENCE ON SOCIAL WORK, in association with the National Council of Social Service, are organizing a conference on "People and Work" at the Victoria Rooms, Clifton, Bristol, from April 10 to 13. Details are available from the secretary, Miss N. Rice-Jones, the National Council of Social Service, 26, Bedford Square, London, W.C.1.

STEIN & ATKINSON, LIMITED, announce that on January 18 they removed from Parnell House, London, S.W.1, to Westminster House, Kew Road, Richmond, Surrey. The premises adjoin Richmond Station (both Southern and District railways). Westminster House, a modern four-storey building, will accommodate the company's entire engineering and administrative departments.

COMMANDER P. W. KENT, R.N., chairman of George Kent, Limited, presided at the company's annual apprentice prize-giving and exhibition of work held at Biscot Road Works, Luton, on January 11. In addition to presenting a large number of prizes for individual successes both in work and studies, Commander Kent reviewed the many collective activities of the firm's apprentices during 1959.

THE FIRST EQUIPMENT under a 2,750,000 railway electrification contract awarded through the Polish Government agency, Elektrim, has been despatched by British Insulated Callender's Construction Company, Limited. Under the contract BICC, together with the English Electric Company, Limited, and Associated Electrical Industries (Manchester), Limited (previously Metropolitan Vickers), are to supply 20 electric locomotives and overhead line equipment.

WELLINGBORO' IRON COMPANY, LIMITED, Northants, announced last week that a second blast-furnace is to be brought back into production to meet the increasing demand for pig-iron. As a result of this a further 100 men will be needed, including furnacemen, locomotive drivers, shunters and plate-layers. Only one furnace has been in operation at Wellingborough since late in 1957; prior to that two furnaces were in production for many years.

EMPLOYEES OF ERNEST H. HILL, LIMITED, brassfounders, Fitzwilliam street, Sheffield, walked out on January 14 because they alleged the factory was too cold. Mr. L. E. Hill, managing director, said the coldness was due to the failure of the automatic installation of the boiler so that it did not operate early in the morning. The management has arranged to keep the heating on for 24 hours instead of 12 a day. The strikers returned to work the following day.

BIRMINGHAM ENGINEERING CENTRE announces that the following companies have become permanent exhibitors at its premises in New Street:—N. Hingley & Sons (Netherton), Limited, steelmakers, etc., of Dudley (Worcs); London Fan & Motor Company, Limited; Dargue Bros., Limited, manufacturers of drawing office furniture, etc., of Halifax; Armstrong Patents Company, Limited, Beverley (Yorks); British Ermeto Corporation, Limited, and Simplex Couplings, Limited, Maidenhead (Berks).

SHELL-MEX & B.P. GASES LIMITED announce that increasing use is being made of liquefied petroleum gases in a number of industrial internal-combustion-engines. Applications of this type of fuel were recently demonstrated at Bingley Hall, Birmingham, when an exhibition of equipment made by six major manufacturers was staged. This included a range of stackers, dumpers and mechanical sweepers, in addition to larger-engined fork-lift trucks. It is understood that conversion kits to adapt these various mechanical aids to operate on petrol gas are also available.

THIS YEAR'S FURNITURE EXHIBITION will be held at Earls Court, London, from January 27 to February 6. It is to be opened by Mr. John C. Rodgers, M.P., Parliamentary Secretary, Board of Trade, and the theme will be "Furnishing to a Figure"—a series of rooms furnished by different designers will be shown, to illustrate how to make the most of available budgets, both big and small. A prominent feature will be a display of single pieces of new and prototype furniture specially selected by the Council of Industrial Design. A section confined to trade buyers will be run concurrently with the public exhibition.

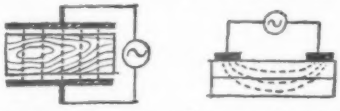
LORD DUDLEY GORDON, chairman of Hadfields Limited, Sheffield, presented long-service awards at the annual dinner of the firm's Jubilee Staff Association on January 8. He said that men who served 50 years with one firm would become a select band of men less often seen in the future. Mr. A. Currier received his 50 years' staff and since his brother, Mr. W. Currier, received

(Continued on page 92)

Electrical Aids in Industry *Data Sheet* **No. 10**

Dielectric Heating - 1

When an electrically non-conducting material is placed between two metal plates, called electrodes, connected to an A.C. supply, the alternating electrostatic field between the electrodes considerably speeds up the molecular movements in the material (termed a 'dielectric') as a result of which the temperature of the material under treatment rises. A similar effect is produced



where the two electrodes are positioned on the same side of the dielectric; in this case the electrostatic field between them is generally known as a 'stray' or 'fringe' field. For industrial application, the applied voltage of the order of 15,000 volts supplied by an electronic generator alternates at frequencies of some millions of cycles per second.

The amount of heat generated in the dielectric is determined by the frequency, the square of the applied voltage, the dimensions of the object and a physical property of the material termed 'loss factor' and is represented by the equation :

Power = $1{\cdot}41\ E^2\ f.F.\ \frac{A}{t} \times 10^{-15}$ kW.

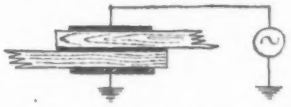
Where E = applied voltage,
f = frequency, F = loss factor.
A = area of the dielectric in square inches.
t = thickness of the dielectric in inches.
F, the loss factor, is itself equal to the expression K Cos Ø in which :
K = the dielectric constant of the material,
Cos Ø = the dielectric power factor of the material.

Therefore, 'loss factor' is a property of the material and a measure of the ease with which it can be heated by this method. Like other physical properties, it varies considerably for different substances. The equation shows that the heat generated in a dielectric is proportional to its loss factor, but the rate of rise of temperature will also depend upon its specific heat and density. The following table gives approximate values of the dielectric constant, power factor and loss factor of a few typical dielectric materials for frequencies around a million cycles a second.

MATERIAL	DIELECTRIC CONSTANT	POWER FACTOR	LOSS FACTOR
Natural Rubber	2·9	0·02	0·058
Oak, dry	3·3	0·04	0·132
P.V.C.	5·3	0·06	0·318
Nylon	3·7	0·05	0·185
Water, pure	80·0	0·03	2·40
Water, tap	80·0	0·5/5·0	40/400

The high loss factor of water means that materials which are difficult to heat when completely dry will often heat efficiently when moisture is present. The voltage must be increased towards the end of the process in some cases to remove the final moisture traces, the reduction in loss factor as the material dries out providing a safeguard against overheating.

If the workpiece is made up of a number of materials, each material will heat up uniformly but each at a rate depending upon its loss factor, thermal properties and density. The degree of temperature uniformity throughout the workpiece will then depend upon the extent to which thermal conductivity can equalise different rates of heating.



Such different rates of heating can be turned to good account in certain applications. For example, in wood glue setting, the glue lines heat up much more rapidly than the wood pieces being joined and the glue sets before the wood heats up substantially, wood having a lower loss factor than glue.

For further information get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, London, W.C.2. Tel : TEMple Bar 9434.

Excellent reference books on electricity and productivity (8/6 each, or 9/- post free) are available — "Induction and Dielectric Heating" is an example.

E.D.A. also have available on free loan in the United Kingdom a series of films on the industrial uses of electricity. Ask for a catalogue.

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CUT HERE

News in Brief

(*Continued from page* 90)

his staff five years ago, there are now five sets of brothers among the 123 members of the Association. 100 attended the dinner. The brothers are Mr. G. and Mr. W. Butler, Mr. A. and Mr. S. Green, Mr. J. A. and Mr. S. Usher, and Mr. A. and Mr. J. Wiseman.

Mr. G. F. TAYLOR, assistant works manager at the foundry of Head, Wrightson & Company, Limited, Thornaby-on-Tees, told an inquest on January 15 how a man had fallen through a 2 ft. 6-in. hole left uncovered on a platform 8 ft. 6-in. above the ground. The man, Thomas Leggatt, aged 57, labourer, Grange Road, Thornaby, died nine days after the accident. James Reid, an apprentice electrician, said that to get access to a fuse box he removed the plate over the hole. He was called away to another job but did not replace the plate as he thought he would be returning. He forgot about it when he was given other work. A verdict of "Accidental Death" was returned.

A FOUR-TON GUIDE-STALK on a 12,000-ton trimming and bending press has been shrunk by the use of liquid nitrogen before being fitted into its housing. The operation, which took place in Glasgow, resulted in a perfect fit without distortion. This method, using 45,000 cub. ft. of liquid nitrogen, was adopted in preference to utilizing expansion (by heating) of the cast-steel housing into which the guide-stalk was to fit. It is averred that the older method would have meant heating the casting for up to eight hours, during which time distortion would almost certainly have taken place. By using liquid nitrogen, a saving of four hours was obtained, and there was no distortion to either component.

AN ORDER has been received by the Power-Gas Corporation (Australasia) Pty., Limited (a member of the Power-Gas Group) from Sulphide Corporation Pty., Limited (a wholly-owned Australian member of the Consolidated Zinc group) for the supply and erection of the charge-handling plant for a new smelter being erected at Cockle Creek, near Newcastle, NSW. The value of the order is about £A300,000 and the installation is to be completed by the end of 1960. The new smelter which is an improved vertical-furnace type developed by Consolidated Zinc's main UK subsidiary, Imperial Smelting Corporation, will utilize the blast-furnace principle to produce zinc and lead metal simultaneously.

THOS. W. WARD, LIMITED, Sheffield, who started the demolition of the Mumbles and Oystermouth Railway in South Wales after the last train had run on January 5, have made the following old-style statement: "We take considerable pride in announcing that we have been entrusted with an Undertaking of Uncommon Magnitude, *viz.* the Dismantling of the World-renowned Mumbles Railway, this being indisputably the Oldest Railway Line in the World for the Conveyance of Ladies and Gentlemen of Quality." Below a picture of a carriage on rails being pulled by a horse, they add that, "There being certain Items, which some may consider to be of Historical Interest, the Company is prepared to consider sympathetically requests for such from Museums, Societies and like Bodies."

THE QUESTION OF A FACTORY for the London and Scandinavian Metallurgical Company, Limited, on the Holbrook Industrial Estate, Halfway, near Sheffield, has raised the issue of pollution of the atmosphere. Chesterfield Rural Council, in whose area the site is, are considering the plans for the metal factory, but have been told that some of the firm's processes resulted in fumes being discharged into the atmosphere. The firm has said that improvements have been made in the processing and there would be no nuisance to nearby householders. But before the Council leases the land to the company, it has decided that members should see the various processes in operation and report back to the Council on any possible pollution aspects. In the meantime, the land which would be used for the factory, is being reserved on offer to the company.

DR. C. SYKES, chairman of Firth-Vickers Stainless Steels, Limited, presented awards to junior employees who had completed day-release and evening courses at the Staybrite Works, Weedon Street, Sheffield, on January 11. He said that financing training schemes for young people was not philanthropy but common sense, for industry had developed to such an extent that it demanded more theoretical knowledge and a higher degree of accuracy if modern equipment was to work properly. Sixty-five junior employees of Firth-Vickers, and the subsidiary, Shepcote Lane Rolling Mills, Limited, received awards. The award for the best craft apprentice went to Roy Evans, apprentice draughtsman, Shepcote Lane Rolling Mills; for the best commercial student to Allan Gould, clerk in the sales department; and Brian Whittington, apprentice patternmaker, stainless-steel foundry, received an award for making the most progress. Mr. J. T. W. Dewar, managing director, presided.

Mr. PHILIP HOLLOWAY, Minister of Industries and Commerce, New Zealand, has stated that the country would be producing a substantial part of its steel needs in reinforcing rods, angles and engineering rounds, flats and squares by the end of 1961. He announced details of a £3,600,000 merchant bar mill at Auckland. New Zealand interests would hold the majority of ordinary shares but UK steel firms and financial interests were expected to invest in share and debenture capital. The mill would use New Zealand steel scrap and produce 50,000 tons of merchant bar products a year. The Minister said that the Government had assured firms sponsoring the scheme that action would be taken to protect the mill from competition by dumped or unfairly-priced products, especially if overseas companies or countries decided to change radically their present policy towards the New Zealand market. Mr. Holloway stated further that there would probably be an embargo on the export of ferrous scrap suitable for the mill.

AT THE 21ST ANNIVERSARY DINNER/DANCE of the West Midland branch of the Institute of Export, held in Birmingham on January 15, Sir Anthony Bowlby, vice-president of the Institute, expressed confidence about Britain's prospects under the European Free Trade schemes. He said that German firms were just as worried about them as British firms, if not more so. Miss Edith Pitt, M.P. for Edgbaston and Parliamentary Secretary to the Ministry of Health, said that sales to the United States and to Canada had advanced 25 per cent. in 1959 to a record figure. Exports by Britain covering all world markets had increased by 5 per cent. On the European Free Trade Area, Miss Pitt said "surely we have enough confidence in ourselves to be able to sell in European markets when we have had such success in the hard markets of North America." Mr. P. W. Underhill, chairman of the West Midlands branch of the Institute, urged improvements in air links between Birmingham and the Continent, a plea which Ald. Donald Johnston, Deputy Mayor of Birmingham, confirmed. Other speakers at the dinner included Ald. Edgar N. Hiley, Deputy Mayor of Solihull and secretary of the National Brass Foundry Association, and Mr. L. P. Lowenthal, treasurer of the branch.

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Raw Material Markets

Iron and Steel

A continued heavy demand for high-duty castings enables most of the engineering and speciality foundries to maintain substantial outputs. Increasing demands for castings are forthcoming from the motor vehicle trade, and the expansion in orders for machine tools, which has been maintained over recent months, has meant the foundries catering for this section being much more favourably employed. Electrical and power plant equipment, steelworks, heavy engineering, and others are using appreciable tonnages of castings with consequent benefit to the foundries supplying them. From collieries and railways, however, only moderate demands for castings are being made.

Pig-iron usage by the engineering and speciality foundries is on a large scale, the chief call being for the low-phosphorus grades. Some brands of this iron are scarce, but overall production appears to be adequate for present needs and the additional supplies which are expected in the near future from increased furnace capacity should ease the present supply and delivery position. Appreciable tonnages of hematite pig-iron are also being taken up, together with increased tonnages of refined iron. The producers of hematite are now much more heavily committed by the increased requirements of the foundries and the steelworks.

Many of the light foundries engaged in the supply of castings for the domestic equipment as well as for the building trades are able to obtain reasonably good outputs. The jobbing foundries are fairly well employed, but many of the textile foundries could undertake a much larger flow of business. Their requirements of the high-phosphorus foundry pig-iron are easily met and producers of this grade have tonnages to spare from stock and current outputs. Orders continue to be received from overseas buyers, relieving the makers of some of their excess tonnages.

Increased outputs of basic pig-iron are now being obtained to meet the additional requirements of the steelworks. These demands will show further expansion as the expected production of steel increases, and also on account of the probable strain on scrap supplies.

There is a continued good demand from the foundries for both cast-iron and steel scrap, particularly for the former in the better and heavier grades.

The re-rollers are busily engaged with their present heavy commitments and they are obtaining substantial outputs of small bars, light sections, and reinforcing rods. Most of the units are committed for their production for some period ahead and fresh business can only be entered for deferred delivery. Most of the re-rollers are very short of steel semis as home steelworks are unable to meet fully the present heavy demand for both consumption and stock requirements, and this results in a hand-to-mouth working on present deliveries.

All arisings at the steelworks of suitable re-rolling quality defectives and crops are readily accepted by the re-rollers.

Non-ferrous Metals

There is still no definite news of a settlement having been reached by Anaconda and Phelps Dodge with the Mine, Mill and Smelters' Union. The other major US producer, Kennecott, has made its peace with the exception of its big property in Utah. Thus, a great deal of US copper production capacity is strike-bound and straws in the wind are few, indicating that work will soon be resumed. All that being so, the London copper market is strong, with the cash price rising gradually but persistently. The concentration of demand on prompt metal coupled with the lack of any settlement in the US has caused the backwardation to widen again to over £12 a ton. The outlook continues good, with demand being very satisfactory from the UK and from the Continent.

In the US the price structure is unchanged; custom smelters are quoting 35 cents and producers 33 cents a pound.

Tin in London is, on balance, a firm market. The market was helped last week by statistics published in the International Tin Council's Statistical Bulletin, which showed that world consumption of primary tin in September reached 13,000 tons, compared with 11,200 tons in August. The good September figures were aided by a recovery in consumption in the UK, France, and, in particular, Federal Germany. The important point about the statistics was that the consumption of metal in the US during September remained at the same low level as in the previous month, reflecting again the effects of the steel strike. With the US steel strike settled and the very good prospects of a recovery in US consumption, the outlook for tin must be considered brighter than was previously thought or forecast. In fact, it is believed that the council had the above statistics in mind when it decided to raise the export quotas for the first quarter of this year by as much as it d'd. Demand in the US is recovering slowly, but the price has yet to move above $1.00 a pound.

Lead continues its improvement in London and the price for cash metal is now around £75 a ton. The rise in the metal price has been slow, but the undertone is firm.

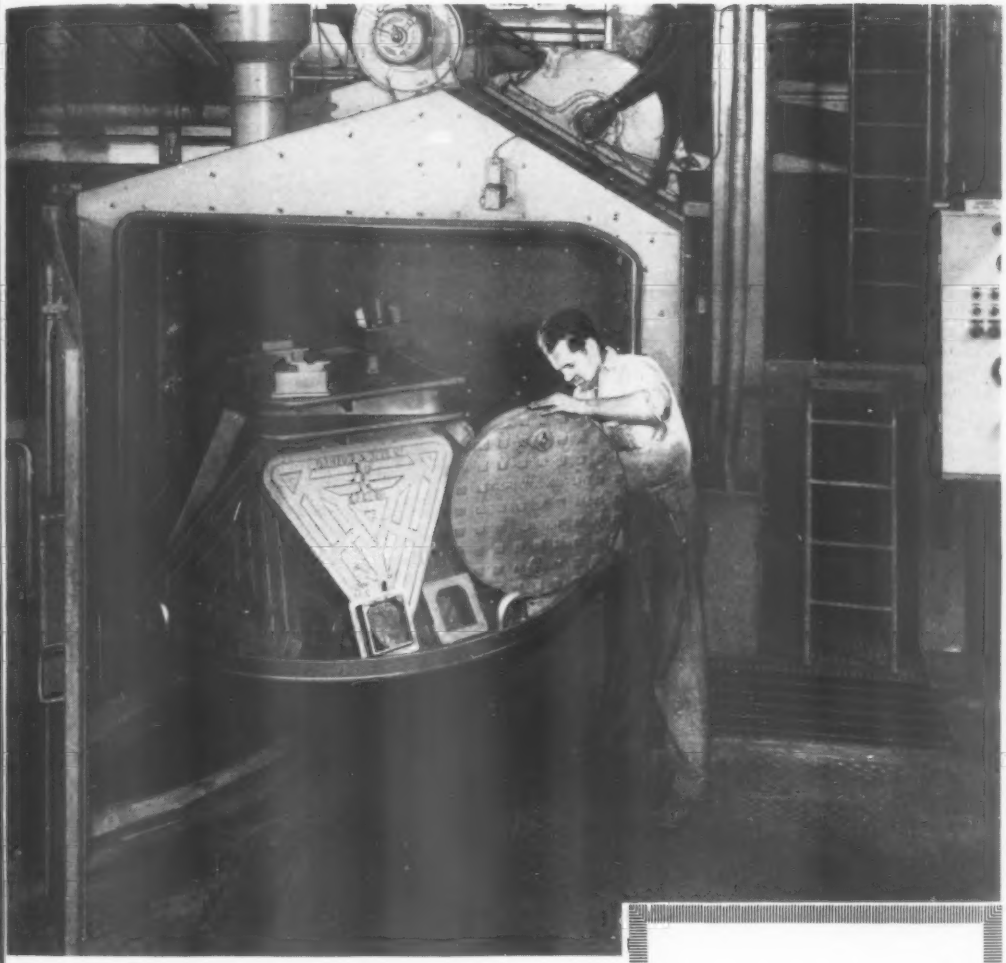
The US market is featureless and the price is unchanged at 12 cents a pound.

Zinc is a good market on both sides of the Atlantic. The US market is satisfactory, with the East St. Louis spot price holding firm at 13 cents a pound. The outlook is good and a continuance of the present high level of demand could result in a further price advance in the not too distant future. The US Tariff Commission last week rejected an appeal to raise the tariffs or place quotas on imports of coated or plated zinc sheets. These sheets are supplied to the US by the UK, West Germany, France, Holland, Belgium, Yugoslavia, and Canada.

Clean Air Act

The Minister of Housing and Local Government received a deputation from the iron and steel industry and other trades on Wednesday, January 13, in regard to the Sheffield and District Clear Air Committee's application to take over responsibility for supervising air-pollution from scheduled processes in the district. The Joint Iron Council, the British Steel Founders' Association and the British Iron & Steel Federation were among those represented. The Minister intends to see the Sheffield committee again before announcing his decision in the matter.

Mr. W. LIONEL FRASER, for nearly 10 years chairman of Babcock & Wilcox, Limited, engineers and boilermakers, etc., of London, N.W.1, is to retire from the board after the company's annual meeting on May 26. In acknowledgment of his services the board has decided to submit a resolution at the annual meeting calling for his appointment to a new post, that of president. Sir KENNETH HAGUE, the deputy chairman, will take over the chairmanship and Sir REGINALD VERDON SMITH will become deputy chairman.



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HISTORICAL NOTE

"At the sign of the Golden Hammer".

The predecessors of Garton & King Ltd., were known in 1662, and they have had a foundry since about 1800. They now produce a wide range of municipal castings and gear wheels, besides general engineering castings in iron, gunmetal and aluminium for use at home and overseas. They still preserve their trade sign of "The Golden Hammer" which has been in use for over 200 years.

Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

January 20, 1960

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2, 10-ton lots or over: Middlesbrough, £21 6s. 0d.: Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.40 per cent. P, 10-ton lots or over, £23 5s. 0d., delivered Birmingham, £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d.; South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.: North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over: N.-E. of England (local iron), £24 14s. 0d.; Scotland (Scotch iron). Zone S.1, £25 0s. 6d.; Sheffield, £26 2s. 6d.; Birmingham, £26 9s. 0d.; Wales (Welsh iron), £24 14s. 0d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire in 10-ton lots or over.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £41 10s. 0d. to £44 0s. 0d., scale 15s. 0d. per unit, lumpy; 75 per cent. Si, £57 0s. 0d. to £62 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 10d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 12s. 0d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 15s. 0d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy).—4/6 per cent. C, £78 10s. 0d. to £82 10s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 28s. 6d. per unit; over 6 per cent. C, £77 0s 0d. to £80 10s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 28s. 6d. per unit; 2 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 1 per cent, C,* 1s. 8½d. to 1s. 11½d. per lb. Cr; 0.15 per cent. C.* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.10 per cent. C,* 2s. 0½d. per lb. Cr; 0.06 per cent. C.* 2s. 1d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £245 0s. 0d.; 96/98 per cent., £275 0s. 0d.

Ferro-columbium.—65/67 per cent., Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £63 10s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., 100 tons & over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 6 to 35 tons, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), under 10 tons, £34 17s. 0d.; silico-manganese, under 10 tons, £43 16s. 6d.; free-cutting, under 10 tons, £36 14s. 6d. SIEMENS MARTIN ACID (under 10 tons): Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d

Billets, Blooms, and Slabs for Forging and for Stamping (under 10 tons).—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

* Average 68–70 per cent.

FINISHED STEEL

Heavy Plates and Sections (under 10 tons).—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3 mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £68 5s. 0d.

Alloy Steel Bars.—1 in. dia. and up; Nickel, £68 10s. 0d.; nickel-chrome, £99 4s. 0d.; nickel chrome-moly Ldenum £111 17s. 0d., in lots of 5 tons to under 10 tons.

NON-FERROUS METALS

Copper.—Cash, £259 0s. 0d. to £259 10s. 0d.; three months, £246 5s. 0d. to £246 10s. 0d.; settlement, £259 10s. 0d

Copper Tubes, etc.—Solid-drawn tubes, 2s. 6d. per lb.; rods, 275s. 0d. per cwt. basis; 20 s.w.g., 310s. 0d. per cwt.

Tin.—Cash, £795 0s. 0d. to £796 0s. 0d.; three months, £790 0s. 0d. to £790 10s. 0d.; settlement, £796 0s. 0d.

Lead (Refined Pig).—Second half January, £74 15s. 0d. to £74 17s. 6d.; second half April, £74 12s. 6d. to £74 15s. 0d.

Zinc.—Second half January, £93 15s. 0d. to £93 17s. 6d.; second half April, £91 15s. 0d. to £92 0s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £130 10s. 0d.; rolled zinc (boiler plates), all English destinations, £128 5s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £107 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 0¾d. per lb.; sheets to 10 w.g., 222s. 3d. per cwt.; wire, 2s. 10½d.; rolled metal, 222s. 3d. per cwt.

Brass (Brazing).—BS1400, B3, £165; B6, £219.

Brass (High Tensile).—BS1400, HTB1, £196; HTB2, £215; HTB3, £228.

Gunmetal.—BS1400, LG2, £210; LG3, £219; G1, 1½%, £275; G1, 1%, £263.

Phosphor Bronze.—BS1400, PB1 (AID released), £309; BS1400, 90/10/1, £295.

Leaded Phosphor Bronze.—BS1400, LPB1, £228.

Phosphor Bronze Strip, etc.—Strip, 312s. 3d. per cwt.; wire, 4s. 3¾d. per lb.; rods, 3s. 6¼d.; tubes, 3s. 6½d.; chill cast bars; solids 3s. 6d.; cored 3s. 7d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide x 0.056, 4s. 0½d. per lb.; round wire, 10g in coils (10 per cent.), 4s. 5½d.; special quality turning rod, 10 per cent. ½ in. dia., in straight lengths, 4s. 4½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 0d. to 2s. 3d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £71 10s. 0d. to £72 0s. 0d. Nickel, £600 0s. 0d. Aluminium, ingots, £186 0s. 0d ; aluminium bronze (BS1400) AB1, £255; AB2, £265.

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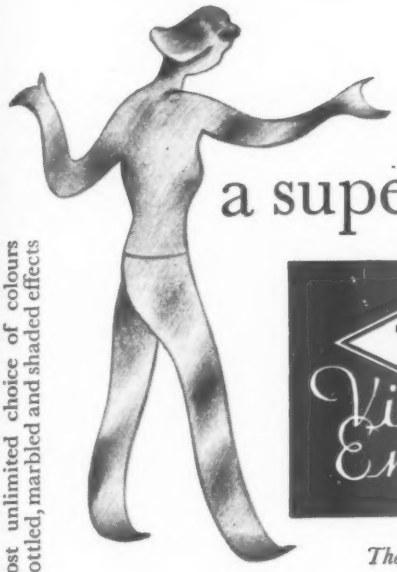

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Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Monday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

FOUNDRY SUPERINTENDENT, Australian, 29, with wide experience in Australian malleable, grey iron and electric steel founding industry, together with US experience, seeks management position in UK in similar industry. Box FS301, FOUNDRY TRADE JOURNAL.

FOUNDRY WORKS MANAGER, 35, B.Sc., technically, practically trained. Five years research, seven years malleable, seven years grey irons, mechanised and floor foundries, complete control. Desires permanent position with progressive foundry. Present salary £1,700. Box FW301, FOUNDRY TRADE JOURNAL.

FOUNDRYMAN, experienced as Metallurgist/Technologist in mechanised and jobbing production, conversant with moulding techniques, green, dry, CO_2, etc., grey and alloy irons, copper alloys, steel, City and Guilds Foundry Practice and Metallurgy, completed managerial training course, age 33, requires responsible position production or technical, preferably in Southern area. Box FE359, FOUNDRY TRADE JOURNAL.

MANAGER/FOREMAN, 41, wide practical experience ferrous and non-ferrous, jobbing mechanisation, seeks position. Box MF344, FOUNDRY TRADE JOURNAL.

ENTHUSIASTIC YOUNG MAN, age 33, supervisory experience wood and metal patternmaking, general engineering and foundry experience, seeks position as technical representative (South) with reputable company. Box EY354, FOUNDRY TRADE JOURNAL.

TECHNICAL REPRESENTATIVE covering high duty iron castings in diesel and automotive field, etc., desires change. Inspection/purchasing liaison. Own car, based West Midlands.—Box TR342, FOUNDRY TRADE JOURNAL.

EXPERIENCED REPRESENTATIVE, practical and technical background, iron and non-ferrous, seeks post with established company. Would consider ingots, binders, castings or sundries sales. Clean licence.—J. W. CAVANAGH, 16, Cumberland Avenue, Slough, Bucks.

FOUNDRYMAN 43 years M.I.B.F. 15 years Managerial Experience Production of High Duty C.I. and Non Ferrous Castings Machine Tool, Marine and General. Fully conversant Estimation, Cupola and Sand Control, CO_2, Air Set, Shell Moulding, etc., 6 years experience abroad. Consider any Genuine offer U.K. or abroad. Box FO340, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

METAL PATTERNMAKERS

FIRST CLASS experienced craftsmen required. High rates, bonus, modern conditions. UNIVERSAL PATTERN PRECISION ENGINEERING CO. LTD., Kelvin Way, Crawley, Sussex.

DEVELOPMENT ENGINEER required for well known Engineering Company expanding existing Foundry capacity. Applicants must have experience of machine design covering mass production of small castings, plant layout and be capable of seeing projects through from drawing board to full production, educated to H.N.C. Write, stating full details of experience and salary required to Box DE334, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

NORTHROP

APPOINTMENT OF FOUNDRY SUPERINTENDENT

Applications are invited for the position of Foundry Superintendent. Theoretical training and extensive practical experience in all aspects of the production of Grey Iron Castings is essential. Additionally, experience in non-ferrous casting, shell and CO_2 methods would be an advantage. Preferably applicants should be in the age group 35-45.

Applications to be Addressed to:
General Manager,
Foundry Division,
BRITISH NORTHROP LIMITED,
BLACKBURN

ASSISTANT METALLURGIST required by Ironfoundry in West Midlands. Applicants should primarily have experience in sand control for a Mechanised Unit. Write giving full details of experience, age and salary required. Box AM337, FOUNDRY TRADE JOURNAL.

LARGE MODERN STEEL FOUNDRY in Yorkshire requires a CHIEF ENGINEER to be responsible for all maintenance duties and for a large development programme. Wide knowledge of heavy engineering together with civil engineering experience is desirable. This is a senior executive position and will be remunerated as such.

A non-contributory pension scheme is in operation and assistance towards housing will be provided if necessary.

Replies, giving details of education and experience, together with an indication of salary required, to Box LM338, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

ADELAIDE, SOUTH AUSTRALIA

FOUNDRY FLUXES & SUPPLIES

LARGE, expanding WHOLESALE MERCHANTS in Adelaide have vacancy for a married man, age 28 to 35, in their Foundry Supplies Dept.

Experience with wholesale merchants in buying, stock control and in the organisation of selling is required. Experience in a foundry is not sufficient.

Apply for further information, quoting reference "FOUNDRY," to DAVIS & SONS LTD., 52 & 54, St. Mary Axe, London, E.C.3.

FOUNDRY MANAGER required for New Foundry just commencing production in West Africa. Applicants should have sound experience in Metallurgy and all aspects appertaining to production of small iron and steel castings. Full details in first instance to Box FM352, FOUNDRY TRADE JOURNAL.

applications . . .
are invited from those with ambition to join expanding sales organisation. Successful applicant, who will be paid salary and expenses will be required to operate from LEEDS and will be responsible direct to principal. Must have sound engineering background and possess current driving licence. Age 30-40.
Box No. AA 330. Foundry Trade Journal.

FOUNDRY SUPERINTENDENT required for small non-ferrous Foundry in East London. Age 30-35. Practical and theoretical knowledge required. State full details of career and salary required to Box FS333, FOUNDRY TRADE JOURNAL.

NON FERROUS FOUNDRY Foreman for New foundry practical man experienced in bronze and aluminium alloys. Good prospects for keen energetic man. Applications in writing stating full qualifications, age, etc.—LONDON ENGINEERS PATTERN COMPANY, LIMITED, Whaddon Works, Purley Way, Croydon, Surrey.

Foundry Manager

for Henry Wallwork & Co. Ltd., of Manchester, ironfounders specializing in high-quality grey-iron castings. Initial remuneration including profits participation, about £2,000 per annum, plus pension scheme and other benefits. Preferred age 35 to 50.

The Foundry Manager will be responsible to the Managing Director and will be in control of the foundry which is completely mechanised. He will also be responsible for providing technical information for estimates and quotations and for the development and application of technical foundry methods.

The appointment offers considerable scope and excellent prospects for an experienced executive with first-class technical background (must be an active member of the Institute of British Foundrymen), including sound knowledge of pattern-making, core-blowing and CO_2 core-making. Must also have extensive experience of mechanised foundry equipment, preferably acquired in a medium-sized organization, plus sound metallurgical knowledge, good appreciation of work study and about five years' experience at management level.

Please write briefly in first instance, quoting Reference No. 342, *to:—*

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The strictest confidence will be observed and no details of candidates will be passed to clients without candidates' permission.

SITUATIONS VACANT—*contd.*

FOUNDRY MANAGER required for cast iron foundry in South Yorkshire producing light castings on floor and machines also engineering castings. Able to estimate from drawings and to work on own initiative. State age, experience and salary required.—Box FM349, FOUNDRY TRADE JOURNAL.

METALLURGIST required by large Ironfounders and Engineers in Central Scotland. Write, giving full particulars of experience and qualifications.—Box MR350, FOUNDRY TRADE JOURNAL.

EXPERIENCED FOUNDRY MANAGER required in Gloucestershire to take charge of small Grey Iron Jobbing Foundry, producing approximately 20 Tons of machinable castings per week. Must have sound and practical knowledge in all departments, with the initiative and ability to control skilled and unskilled labour. Write giving age and full details of experience.—Box EF343, FOUNDRY TRADE JOURNAL.

MOULDERS—Two vacancies for Floor Moulders—preferably experienced in aluminium alloy. Write or call, LIGHTALLOYS, LTD., St. Leonards Road, Willesden, N.W.10.

VIEWER REQUIRED—with some experience of sand moulding in aluminium. Definite promotion prospects for right man. Write with details to LIGHTALLOYS, LTD., St. Leonards Road, Willesden, N.W.10.

PATTERNMAKERS—Wood and Metal—required. Coventry area. High rates, bonus, ideal conditions.—Box PW341, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN, aged 30-35, required as first assistant to foundry manager at well known progressive non-ferrous foundry in N.W. manufacturing bronze and light alloy castings. A realistic expansion programme is in operation and the appointment calls for a man of character, initiative and ability to control all grades of labour. Box AG358, FOUNDRY TRADE JOURNAL.

AUSTRALIAN COMPANY with mechanised Bath Plant invites applications for position of ASSISTANT FOUNDRY MANAGER. Experience similar plant an advantage. Free passages; excellent prospects; accommodation available. Apply in writing: METTERS LTD., 74, High Street, Rickmansworth, Herts.

ASSISTANT FOUNDRY MANAGER required for a Grey Iron Foundry which is an integral part of a company of Power Transmission Engineers and is situated in the West Riding of Yorkshire. The present Foundry Manager retires in 18 months time and the successful applicant will be expected to succeed him at the end of that period. Sound practical experience in all aspects of Grey Iron Foundry operation and technique is essential. Reply giving details of age, training and experience to Box 1299, WILLIAMS'S ADVERTISING OFFICES, 29, Kirkgate, Bradford.

WORKS MANAGER

WORKS MANAGER required for Repetition Grey Iron Foundry producing castings for the Automobile Trade, which is being developed to produce over 500 tons per week. Applicant should have received first-class technical and practical training. Must be prepared to use own initiative and accept full responsibility. This is a progressive position with the possibility of a Directorship. Preference will be given to applicant who has held a similar position in the past. Salary commensurate with experience. Reply by letter to REPTON FOUNDRY LTD., Britannia Street, Tividale, Tipton, Staffs. All replies will be treated in the strictest confidence.

SITUATIONS VACANT—*contd.*

ASSISTANT FOREMAN, preferably about 30, experienced in repetition production of small grey iron castings, required for well-known mechanised foundry in West Midlands. Good prospects. Apply giving details of education, experience and salary to Box AF335, FOUNDRY TRADE JOURNAL.

DESIGN DRAUGHTSMEN required by well known Foundry Equipment Manufacturers in Manchester area. Good prospects and ideal working conditions. Box DD336, FOUNDRY TRADE JOURNAL.

WANTED — PATTERN-MAKER for small Engineering Works and Foundry in Home Counties.—Apply Box WP348, FOUNDRY TRADE JOURNAL.

ASSISTANT to SALES MANAGER required for Foundry producing small engineering components. Applicants should be familiar with engineering drawing and knowledge of foundry practice would be desirable but not essential. This is a superannuated appointment and salary would be commensurate with experience. Apply in writing to P.I. CASTINGS (ALTRINCHAM) LIMITED, Atlantic Street, Altrincham, Cheshire.

NON-FERROUS FOUNDRY FOREMAN required by well known West Country Engineers. Must be fully experienced in all aspects of the manufacture of Gunmetals, Bronzes and Light Alloy Castings. Box NF360, FOUNDRY TRADE JOURNAL.

WANTED. Practical FOUNDRYMAN fully experienced in melting and casting techniques of all non-ferrous metals, South Wales Area. Box PF361, FOUNDRY TRADE JOURNAL.

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SALES AGENT offers services to Foundries. Grey iron and malleables. London area covered. Part expenses and commission. Box SA353, FOUNDRY TRADE JOURNAL.

AGENT based on Birmingham with extensive connection in Midlands among large industrial groups desires to contact manufacturer of diecastings in aluminium, mazak, lead and tin alloys, etc., with view to representation on part expense and commission basis only. Anyone interested please communicate with Box AB355, FOUNDRY TRADE JOURNAL.

AGENCY

REPRESENTATIVES REQUIRED

LIVE AGENTS required in several industrial areas in United Kingdom, calling on Foundries, Boiler Houses, etc., to sell Refractories. Right men can earn over £2,500 per annum. Write to: CORROSION LIMITED, Malvern Road, Southampton.

AGENT, able to expand existing connection, wanted for London and Home Counties by Midland Ironfounders specialising in repetition grey iron castings for the light engineering and electrical trades. Commission basis. Full particulars to Box AG339, FOUNDRY TRADE JOURNAL.

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MACHINERY WANTED

WANTED. One Jolt Squeeze Turnover Machine also one pin lift suitable for 18 in. square, 6 in. deep copes and drags. Details and price to Box WO346, FOUNDRY TRADE JOURNAL.

WANTED. Secondhand Batch Sand Mill, approximately 8 ft. diameter, with bucket loader. Box WS347, FOUNDRY TRADE JOURNAL.

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HPL1. MOULDING MACHINES. Nos. 1 & 2 Pneulec Rovers.
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Sand Mills: 3 ft., 4 ft., 5 ft. and 6 ft. diameter.
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SHIRLAW, ALLAN & CO., AUCTIONEERS, HAMILTON, have received instructions from **MESSRS. WEIR FOUNDRIES LTD.,** to Sell, by Auction, as above.

Hamilton, January, 1960. *On view from 5th January, 1960. Catalogues from Auctioneers.*

MACHINERY FOR SALE—*contd.*

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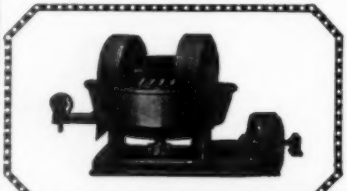

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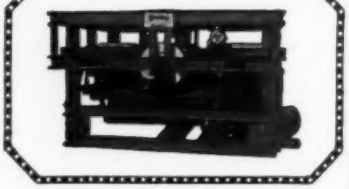

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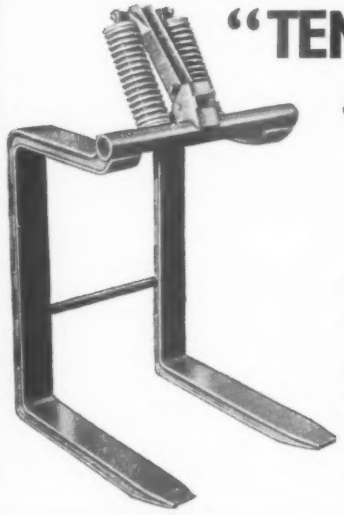

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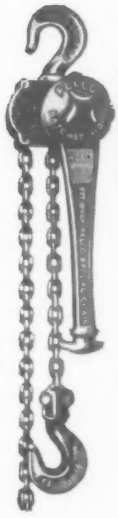

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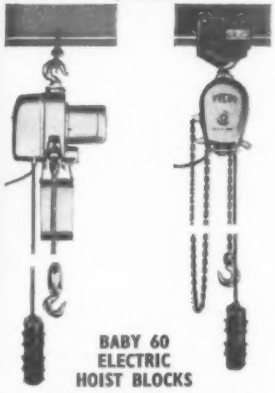

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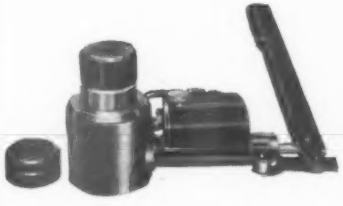

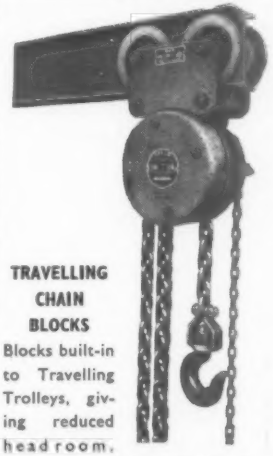

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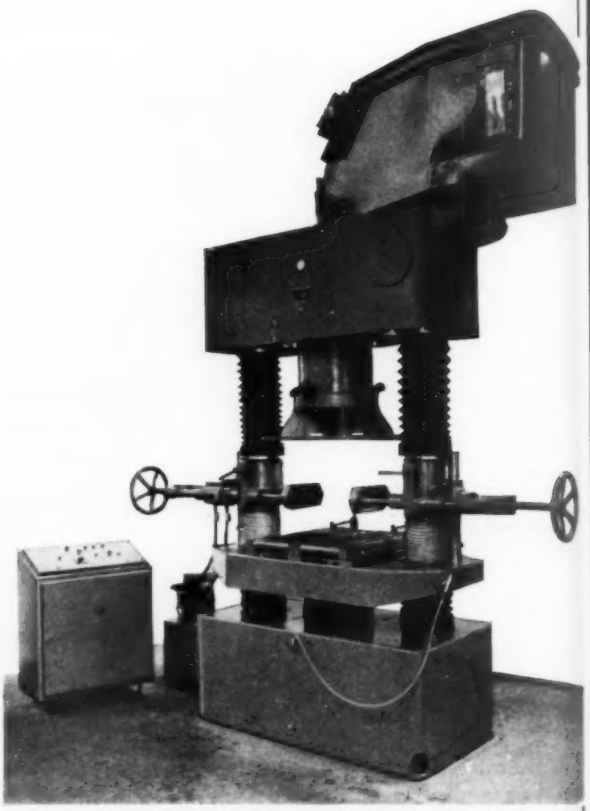

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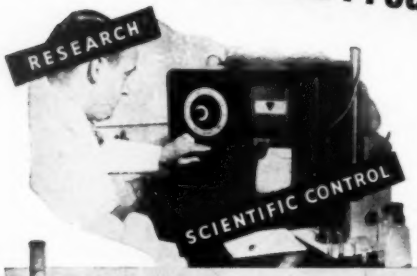

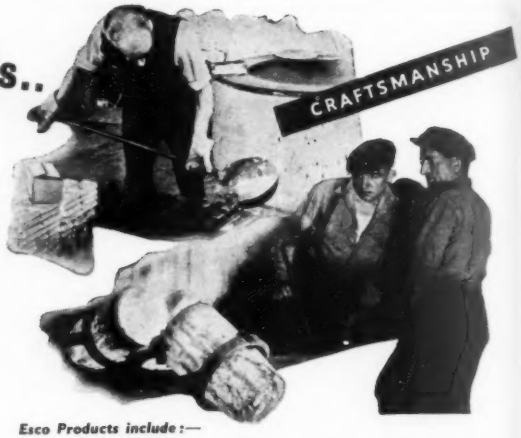

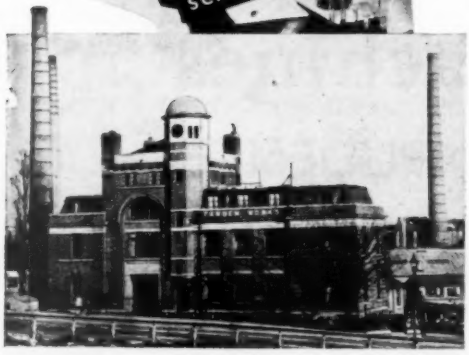

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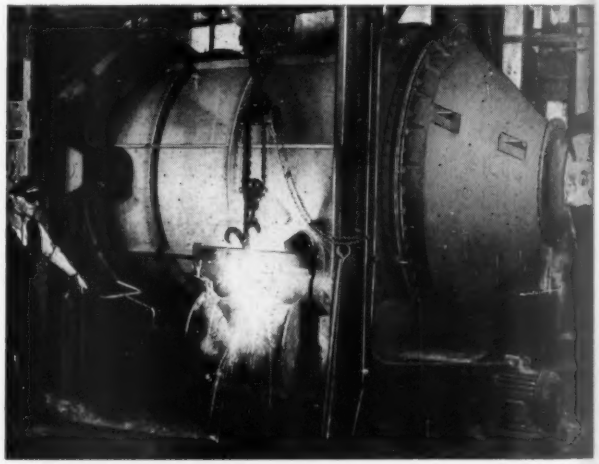

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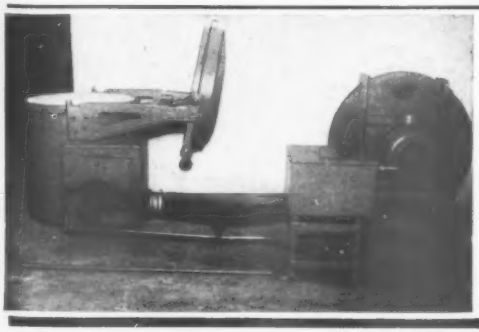

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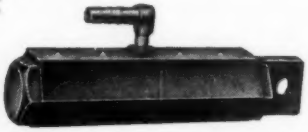

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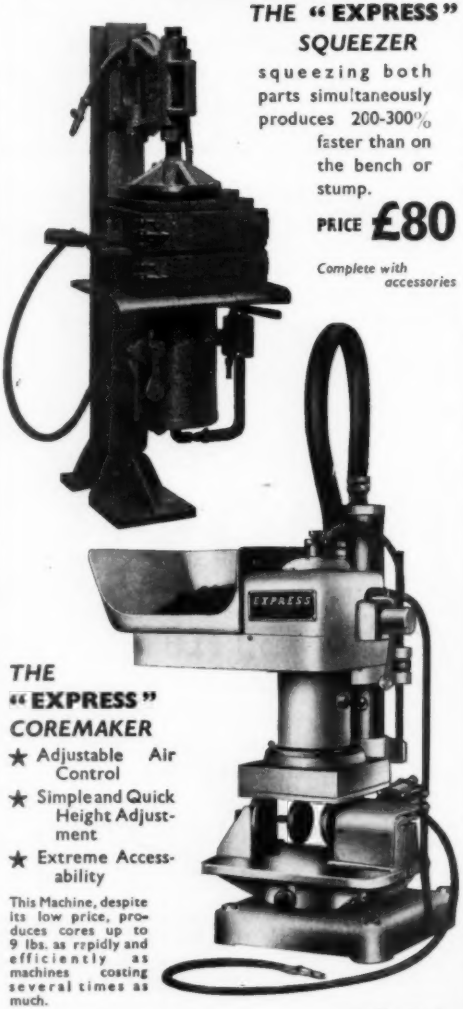

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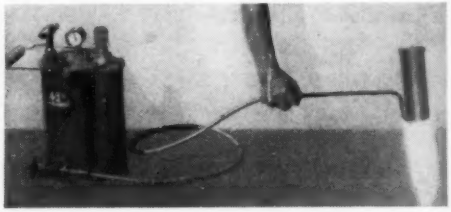

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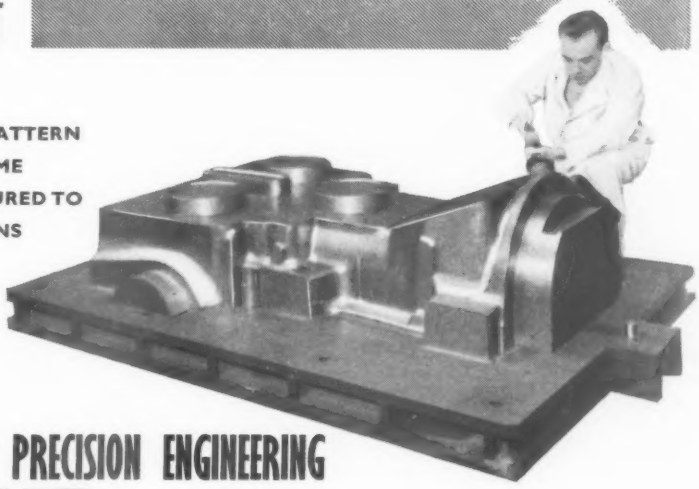

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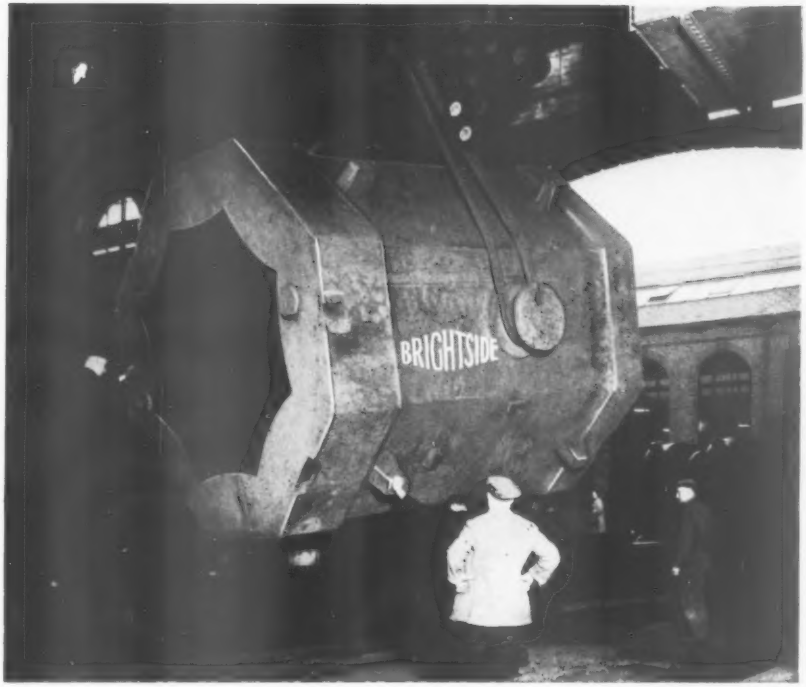

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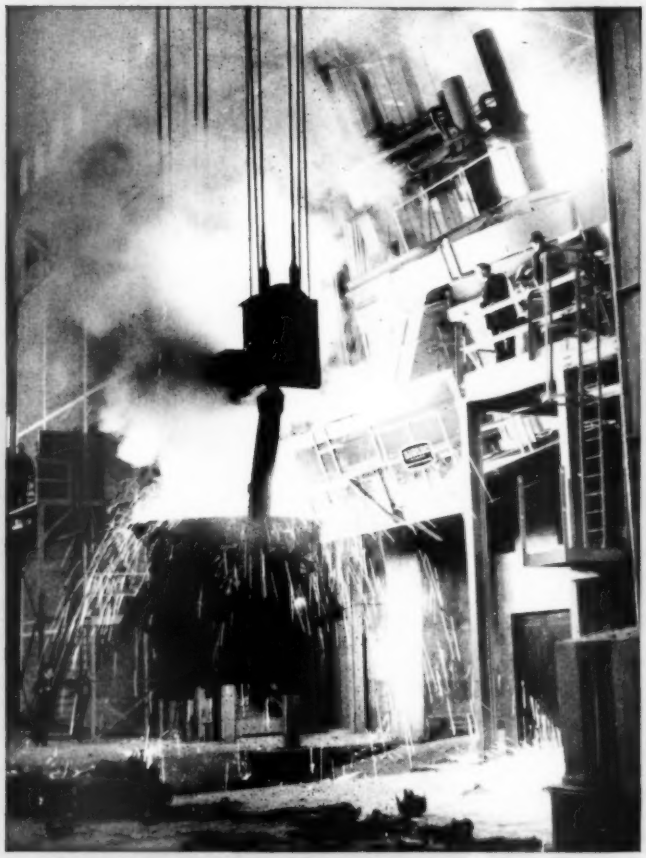
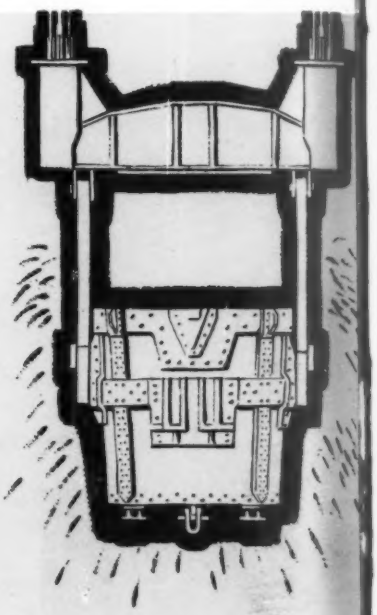


Tapping one of the three electric arc furnaces installed in the new melting shop at Brymbo Steel Works Limited, Wrexham.



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The three 16-ft. electric arc furnaces installed at Brymbo Steel Works Limited, each rated at 12,500 kVA, have replaced the company's open hearth plant, an important departure from conventional practice.

Though ordered from Birlec Limited before the amalgamation of their melting interests with those of Efco Limited, these units are typical of the Birlefco range of arc furnaces. Between them, the constituent companies have built more than 600 arc furnaces throughout the world, including every British installation exceeding 30 tons capacity.

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